STUDY OF CORRELATION OF DIABETIC MACULOPATHY WITH THE STAGE OF DIABETIC RETINOPATHY

DISSERTATION SUBMITTED TO

THE TAMILNADU DR.M.G.R. MEDICAL UNIVERSITY

CHENNAI

in partial fulfilment of

the requirements for the degree of

M.S. (OPHTHALMOLOGY)

BRANCH – III

TIRUNELVELI MEDICAL COLLEGE

TIRUNELVELI

APRIL-2016

CERTIFICATE

This is to certify that this Dissertation entitled "**STUDY OF CORRELATION OF DIABETIC MACULOPATHY WITH THE STAGE OF DIABETIC RETINOPATHY"** is the bonafide original work of **Dr. ROHINI. A**., during the period of her Post graduate study from 2013 –2016, under my guidance and supervision, in the Department of Ophthalmology Tirunelveli Medical College & Hospital, Tirunelveli, in partial fulfillment of the requirement for M.S., (Branch III) in Ophthalmology examination of the Tamilnadu Dr.M.G.R Medical University will be held in April 2016.

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This is to certify that this dissertation entitled **"STUDY OF CORRELATION OF DIABETIC MACULOPATHY WITH THE STAGE OF DIABETIC RETINOPATHY"** submitted by **Dr. ROHINI. A.** is a bonafide research work carried out by her under my guidance.

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NAME OF PRINCIPAL INVESTIGATOR: Dr. A.Rohini, MBBS.,
DESIGNATION OF PRINCIPAL INVESTIGATOR: Post Graduate in MS Ophthalmology
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Dear Dr. A.Rohini, *The Tirunelveli Medical College Institutional Ethics Committee (TIREC) reviewed and discussed your application during the IEC meeting held on 14.05.14.*

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1.	TIREC Application Form	☐
2.	Study Protocol	☐
3.	Department Research Committee Approval	☐
4.	Patient Information Document and Consent Form in English and Vernacular Language	☐
5.	Investigator's Brochure	☐
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10.	Investigator's Undertaking	☐
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12.	Clinical Trial Agreement (CTA)	☐
13.	Memorandum of Understanding (MOU)/Material Transfer Agreement (MTA)	☐
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1. The approval is valid for a period of 2 year/s or duration of project whichever is later
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I hereby declare that this dissertation entitled "**STUDY OF CORRELATION OF DIABETIC MACULOPATHY WITH THE STAGE OF DIABETIC RETINOPATHY**" is a bonafide and genuine research work carried out by me under the guidance of **Dr. ANANDHI .D.,** Assistant Professor of Ophthalmology, Department of Ophthalmology, Tirunelveli Medical College, Tirunelveli

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CONTENTS

LIST OF TABLES

ABBREVIATIONS

1. A:V – Artery: Vein
2. ADED – Advanced Diabetic Eye Disease
3. BDR – Background Diabetic Retinopathy
4. BP – Blood Pressure
5. BRB – Blood Retinal Barrier
6. CNP – Capillary Non-Perfusion
7. CSME – Clinically Significant Macular Edema
8. DCCT – Diabetes Control and Complications Trial
9. DM – Diabetes Mellitus
10. DME – Diabetic Macular Edema
11. DR- Diabetic Retinopathy
12. DRCR.net – Diabetic Retinopathy Clinical Research Network
13. DRS – Diabetic Retinopathy Study
14. ETDRS- Early Treatment Diabetic Retinopathy Study
15. FAZ – Foveal Avascular Zone
16. FBS – Fasting Blood Sugar
17. FFA – Fundus Fluorescein Angiography
18. FU – Follow-Up
19. Hb - Haemoglobin
20. HbA1C – Glycosylated haemoglobin
21. HDL – High Density Lipoprotein
22. IOP – Intra Ocular Pressure
23. IRMA- Intra Retinal Microvascular Abnormality
24. IVTA – Intravitreal Triamcinolone Acetonide
25. LDL – Low Density Lipoprotein
26. MVL – Moderate Visual Loss
27. N/A – Not Applicable
28. NPDR- Non-Proliferative Diabetic Retinopathy

29. NSAID – Non-Steroidal Anti-inflammatory Drug
30. NVD – New Vessels on the Disc
31. NVE - New Vessels Elsewhere
32. OCT – Optical Coherence Tomography
33. OHA – Oral Hypoglycaemic Agents
34. PDR- Proliferative Diabetic Retinopathy
35. PPBS – Post-prandial blood sugar
36. PPV – Pars Plana Vitrectomy
37. PRP – Panretinal Photocoagulation
38. RPE – Retinal Pigment Epithelium
39. SVL – Severe Visual Loss
40. TGL - Triglycerides
41. UKPDS – United Kingdom Prospective Diabetes Study
42. VEGF – Vascular Endothelial Growth Factor
43. VLDL - Very Low Density Lipoprotein
44. VMT – Vitreo- Macular Traction
45. WESDR – Wisconsin Epidemiological Study of Diabetic Retinopathy

1. HISTORY

Diabetes was described before Christ as the “honey urine” by Sushrutha in Hindu medicine. In 1815, Michael Eugene Chevreul discovered the presence of glucose in urine[1], and in 1889 Joseph Von Mering and Oscar Minkowski excised the pancreas[1] to demonstrate diabetes on dogs. In 1921, Frederick Grant Banting and Charles Herbert Best discovered insulin[1].

In 1856, Von Jager first described the fundus changes in diabetics . Further manifestations were elaborated by Hirschberg in 1890-91.

Diabetes mellitus occurs in two forms: Type I or Insulin Dependent Diabetes Mellitus or Immune mediated Diabetes and Type II or Non-Insulin Dependent Diabetes Mellitus. Diabetes results in micro and macrovascular complications. Microvascular complications are due to microangiopathy and directly linked to glycaemic control. Microangiopathy includes diabetic nephropathy, retinopathy and peripheral neuropathy. Macrovascular complications are not linked to level of hyperglycaemia and affect brain, heart and limbs.

2. EPIDEMIOLOGY

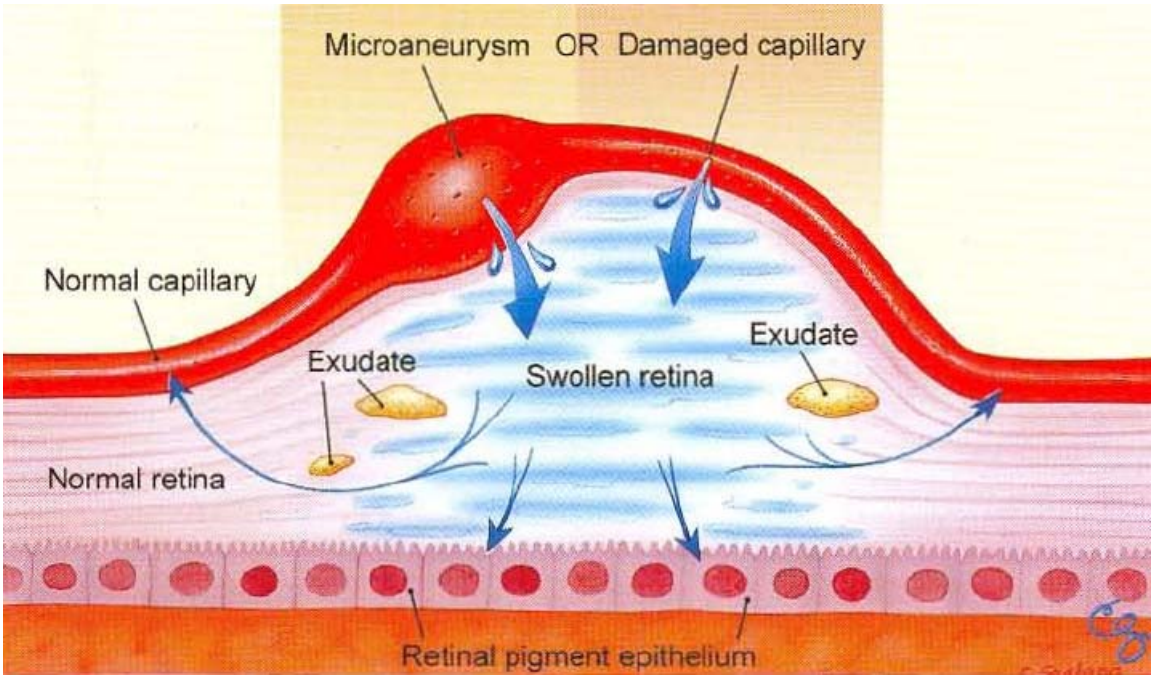
Diabetics are at 20-25 times greater risk of blindness than the normal population[2].

The prevalence of diabetic retinopathy increases with the duration of diabetes and patient age. DR is rare before 10 years of age. In IDDM, the incidence of DR is 25% within 5 years of onset, 60% in 10 years and 80% in 15 years and the risk of progression to PDR is 18% within 15 years and 50% in 20 years . In type II diabetes mellitus, the incidence of DR is 24-40% within 5 years of onset and 53-84% in 19 year and the risk of progression to PDR in 5 years is 2% and in 25 years is 25%[3].

3. PATHOGENESIS

Exposure to hyperglycemia over an extended period results in biochemical, pathophysiologic, haematological and rheologic changes that cause endothelial damage.

Selective loss of pericytes and basement membrane thickening favour decompensation of the blood retinal barrier function, which allows serum leakage and retinal edema. The haematologic and biochemical abnormalities that are correlated with the prevalence and severity of retinopathy include increased platelet adhesiveness, increased erythrocyte aggregation, abnormal serum lipids, defective fibrinolysis, abnormal levels of growth hormone, upregulation of vascular endothelial growth factor (VEGF) and abnormalities in serum and whole blood viscosity[4].



4. RISK FACTORS FOR DIABETIC RETINOPATHY

Can be classified into external, internal and ocular factors[5].

A) EXTERNAL FACTORS:

Diabetic control and diet, alcohol consumption, smoking, contraceptive pills and aspirin.

a) Diabetic control :

Severity of DR progresses with uncontrolled blood sugar levels. The Oslo and Diabetes Control and Complications Trial(DCCT) concluded that long term contol of HbA 1C is beneficial in NPDR[5].

b)Alcohol consumption:

Alcohol plays a role in the development of macular edema and the progression to proliferative diabetic retinopathy.

c) Smoking:

Smoking increases microalbuminuria and cause microvascular changes in the retina. Smoking causes more progression of NPDR to PDR.

d) Contraceptive pill:

Progesterone pill causes progression of retinopathy. Retinopathy improves on stopping the pill.

e)Aspirin:

Aspirin has no beneficial effect on the onset or progression of DR. Stopping aspirin is not needed in vitreous haemorrhage.

B) INTERNAL FACTORS:

Age, arterial hypertension, lipids, nephropathy and pregnancy.

a)Age:

The younger age group usually have type I diabetes and develop PDR and older group have type II diabetes and develop macular edema.

b) Hypertension and lipids:

Arterial hypertension causes deterioration of diabetic retinopathy by damaging retinal capillary endothelial cells through increased blood flow[6]. Ischaemic changes are more prominent than leakage.

Hypertension may be secondary to diabetic nephropathy. Maculopathy may be aggravated by hypertension.

Hypercholesterolemia enhances formation of hard exudates[7].

c) Diabetic nephropathy:

Increase in blood pressure, fibrinogen levels, and raised lipoproteins aggravates DR and macular edema as a result of altered hydrostatic and oncotic forces in the retinal micro-circulation.

d) Pregnancy:

Factors that accelerate the DR are pregnancy per se, hyperglycaemia, arterial hypertension, rapid normalization of blood glucose levels, duration of diabetes, and stage of DR at baseline.

C) OCULAR FACTORS:

a) Cataract surgery:

Cataracts obscure developing treatable DR and alter the prognosis. Cataract extraction with a small incision cataract technique and phacoemulsification may aggravate both existing macular edema and PDR and may hasten the onset of rubeosis iridis.

b) Iris neovascularisation:

Rubeosis iridis is a sign of rapid progression of DR. Once rubeosis is detected, full scatter PRP is done to prevent neovascular and absolute glaucoma.

PROTECTIVE FACTORS:

High myopia, choroidal atrophy, glaucoma, retinitis pigmentosa and optic atrophy protect against PDR by reducing the metabolic needs of retina and act in the same way as PRP.

Posterior vitreous detachment prevents the progression of PDR because of the missing scaffold for new vessels.

In diabetics with pituitary abnormalities such as low levels of growth hormone, PDR is rare. Pituitary ablation was the only method of controlling high risk PDR before the advent of panretinal photocoagulation.

5. CLASSIFICATION OF DIABETIC RETINOPATHY

ETDRS CLASSIFICATION

NPDR has been further classified as under:

1. ***Mild NPDR***

- At least one microaneurysm or intraretinal hemorrhage.
- Hard/soft exudates may or may not be present.

2. ***Moderate NPDR***

- Moderate microaneurysms / intraretinal hemorrhage (more than ETDRS standard photograph 2A).
- Early mild IRMA.
- Hard/soft exudates may or may not present.

3. ***Severe NPDR***: Any one of the following (4-2-1 Rule)

- Four quadrants of severe microaneurysms/ intraretinal hemorrhages.
- Two quadrants of venous beading.
- One quadrant of IRMA changes.

4. ***Very severe NPDR***: Two or more of the criteria for severe NPDR

Proliferative Diabetic retinopathy(PDR):

i) PDR without high risk characteristics(Early PDR):

New vessels on the disc (NVD), new vessels elsewhere (NVE), but insufficient to meet the high risk criteria.

ii) PDR with high risk characteristics (High risk PDR):

New vessels on the disc (NVD) greater than ETDRS standard photograph 10A(about 1/3 disc area).

Any NVD with vitreous or preretinal haemorrhage

NVE greater than ½ disc area with vitreous or preretinal haemorrhage(or haemorrhage with presumed obscured NVD/NVE)

Advanced diabetic eye disease:

i) Persistent vitreous haemorrhage

ii) Tractional retinal detachment

iii) Neovascular glaucoma

I) Non-Proliferative diabetic retinopathy :

Retinal microvascular changes in NPDR include microaneurysms, hard exudates, dot-and-blot intraretinal hemorrhages, venous beading, IRMA, areas of capillary nonperfusion, nerve fiber layer (NFL) infarcts (cotton wool spots) and retinal edema.

Microaneurysms, small retinal haemorrhages :

A microaneurysm is defined as a red spot <125 microns with sharp margins.

Microaneurysms are dilatations of retinal capillaries. The size varies from 10micron to 125 micron.

Most microaneurysms are found in the posterior pole temporal to the fovea.

Haemorrhages:

Intraretinal haemorrhages

Preretinal haemorrhages

Vitreous haemorrhages

Subretinal haemorrhages

Intraretinal haemorrhages:

Include round haemorrhages, flame shaped haemorrhages, blotch(cluster) haemorrhages, and diffuse haemorrhages

Round haemorrhages:

The round dot haemorrhage appears as a bright red dot which is < 200 microns. They lie most commonly at the level of deep plexus.

Flame shaped haemorrhages

Flame haemorrhages are superficial haemorrhages just under the nerve fibre layer with filamented end oriented in the direction of the nerve fibre layer. They do not indicate the severity of DR.

Blot haemorrhages

Blot haemorrhages occur at the level of outer plexiform layer due to capillary fragility as a result of retinal ischaemia.

Hard exudates

White or yellow deposits with sharp margins in the outer retinal layers due to leakage on the venous side of capillaries.

Cotton wool spots (Soft exudates)

Arteriolar occlusion leads to axoplasmic stasis in the nerve fibre layer of the retina leading to fluffy white opaque areas.

Intraretinal microvascular abnormality (IRMA)

IRMA is defined as tortuous intraretinal vascular segments varying in calibre. IRMA are small collateral vessels on the borders of areas of non-perfused retina and are a sign of retinal ischaemia.

Venous abnormalities

Venous loop, reduplication and venous beading all occur due to increase in calibre and length of vein as a result of retinal ischaemia. Rarely Venous narrowing, venous sheathing and perivenous exudate can occur.

II) Proliferative DR

New vessels on and/or within 1 DD of the disc (NVD) :

New vessels on the disc (NVD) are new immature vessels developing within 1 disc diameter of the optic disc. They have circular frond like tips. Regression of new vessels after treatment is evidenced by fibrosis.

New vessels 'elsewhere' (NVE):

New vessels elsewhere (NVE) are new immature vessels developing more than 1 disc diameter away from the optic disc and usually occurring on the edge of an area of retinal ischaemia . They also have circular frond like tips.

Fibrous proliferation on or within 1 disc diameter of the disc margin:

Fibrous proliferation at the disc (FPD) is opaque, fibrous tissue at the disc or less than 1 disc diameter (DD) from the disc margin with or without accompanying new vessels

Fibrous proliferation 'elsewhere':

Fibrous proliferation elsewhere (FPE) is opaque fibrous tissue more than 1 DD from the disc margin with or without accompanying new vessels

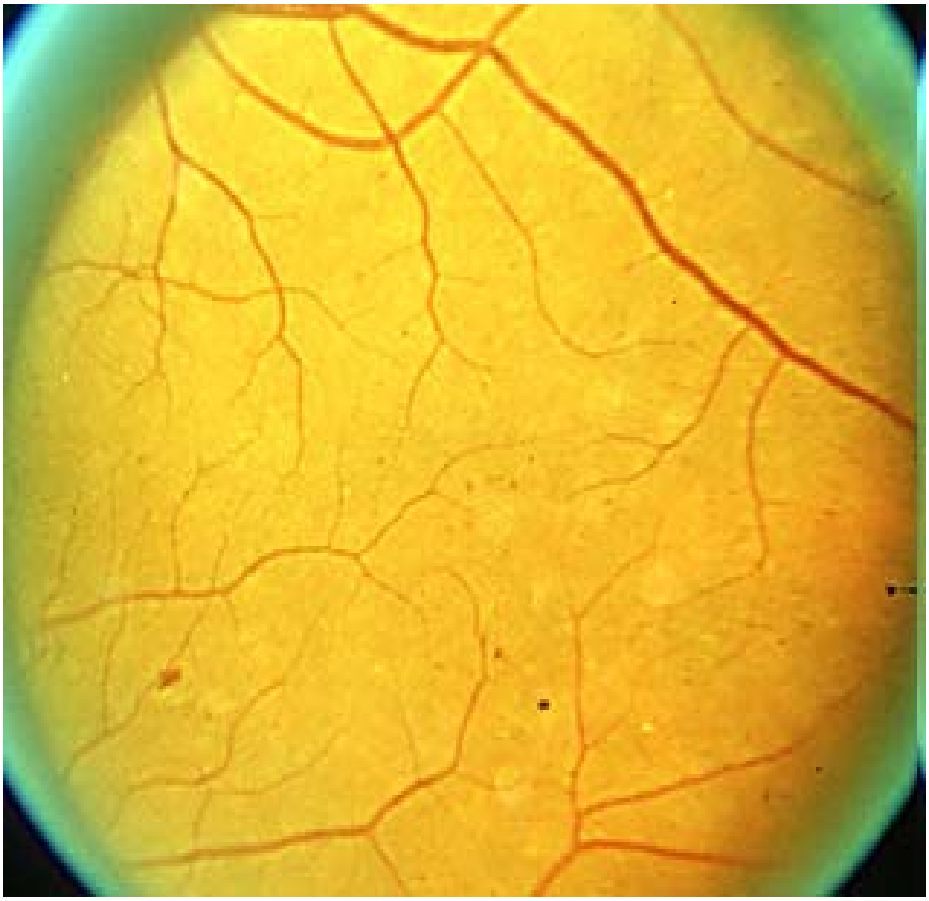
Preretinal haemorrhage(PRH)

Boat-shaped haemorrhages just anterior to the retina or under the internal limiting membrane.

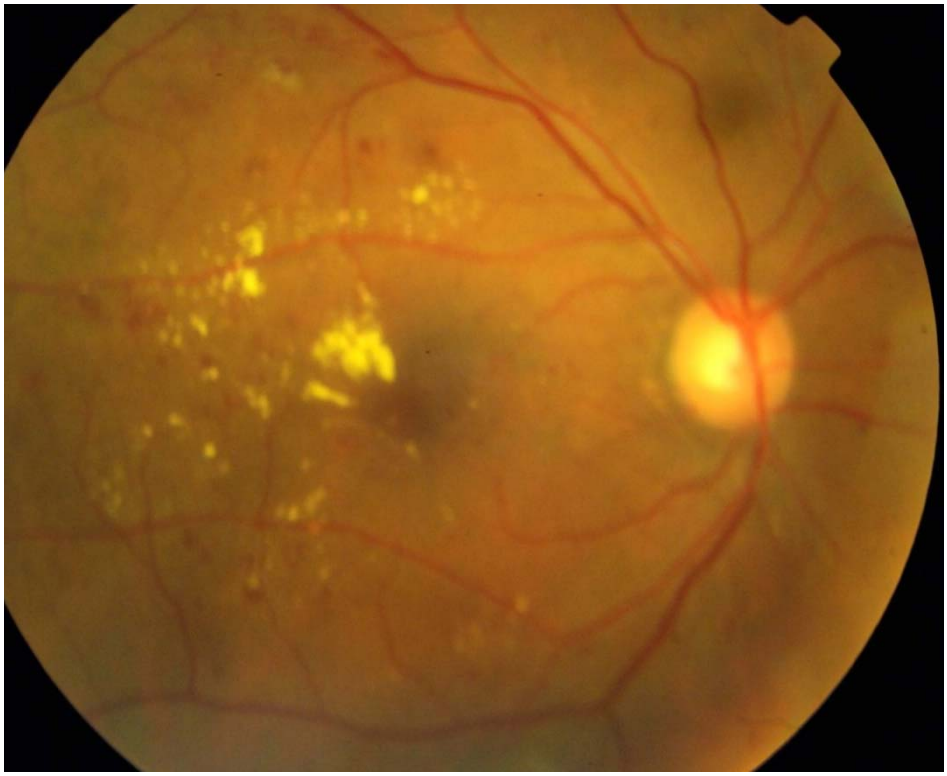
Vitreous haemorrhage (VH)

Haemorrhage in the vitreous gel after crossing the internal limiting membrane.

MILD NPDR



MODERATE NPDR



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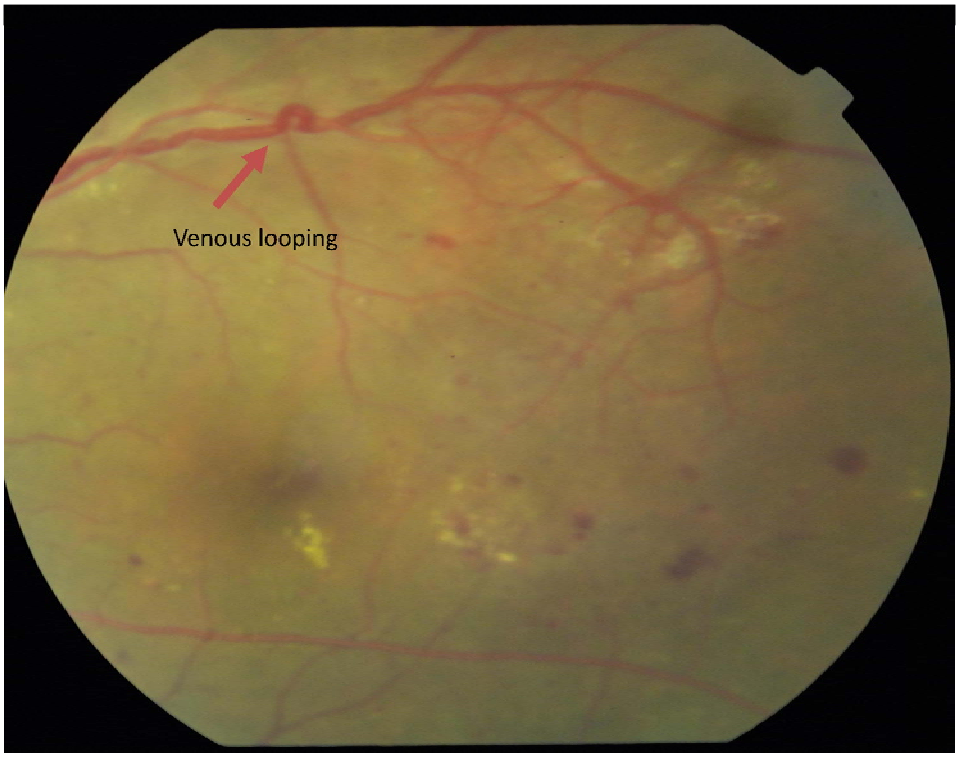
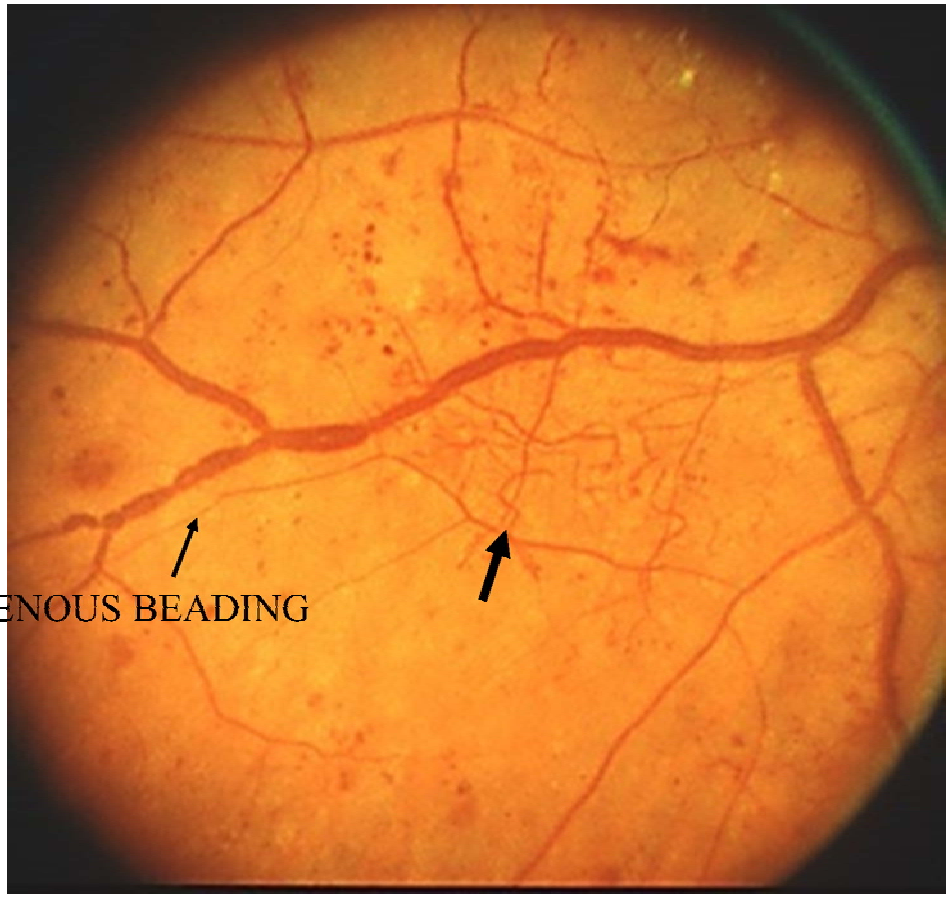
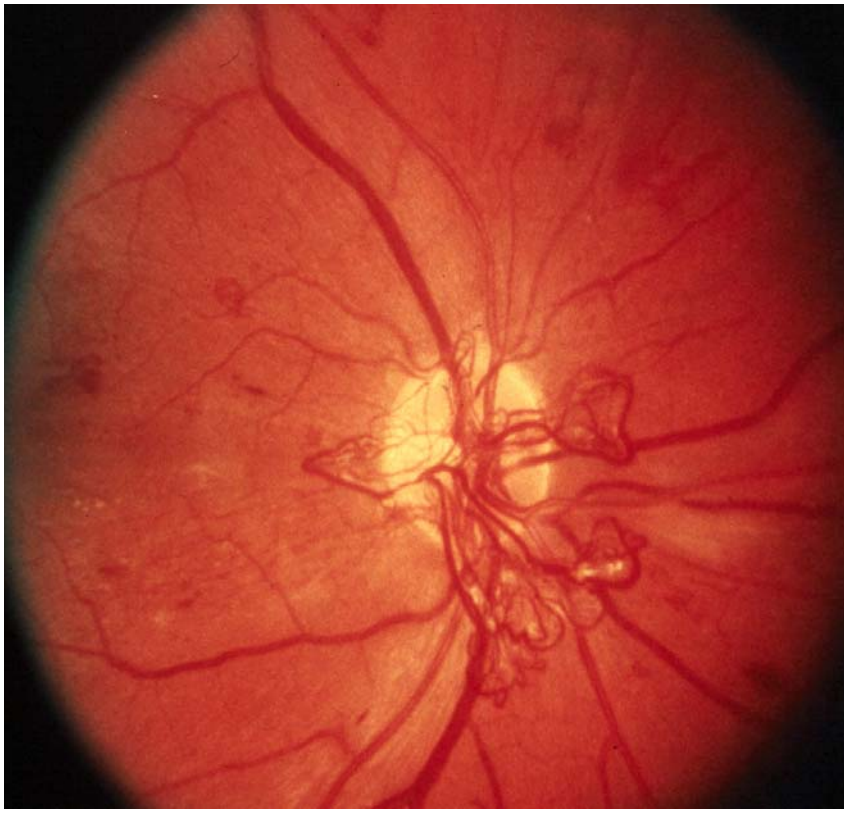


VERY SEVERE NPDR

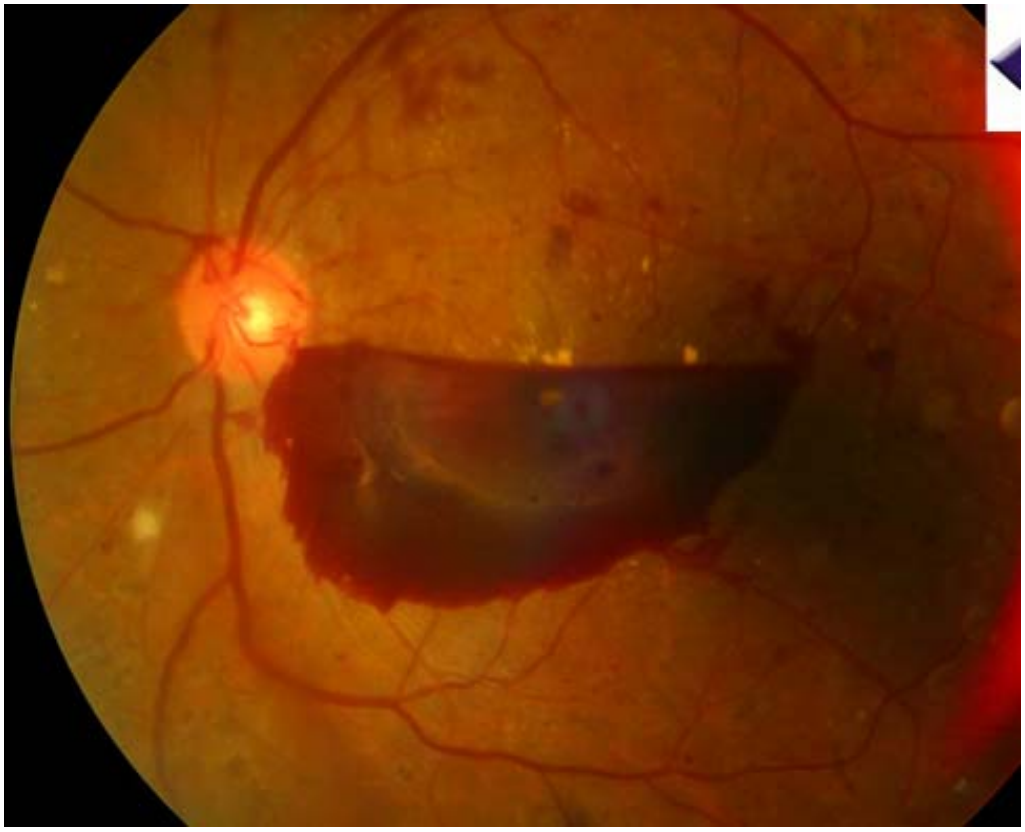


NVD > 1/3 of the Disc

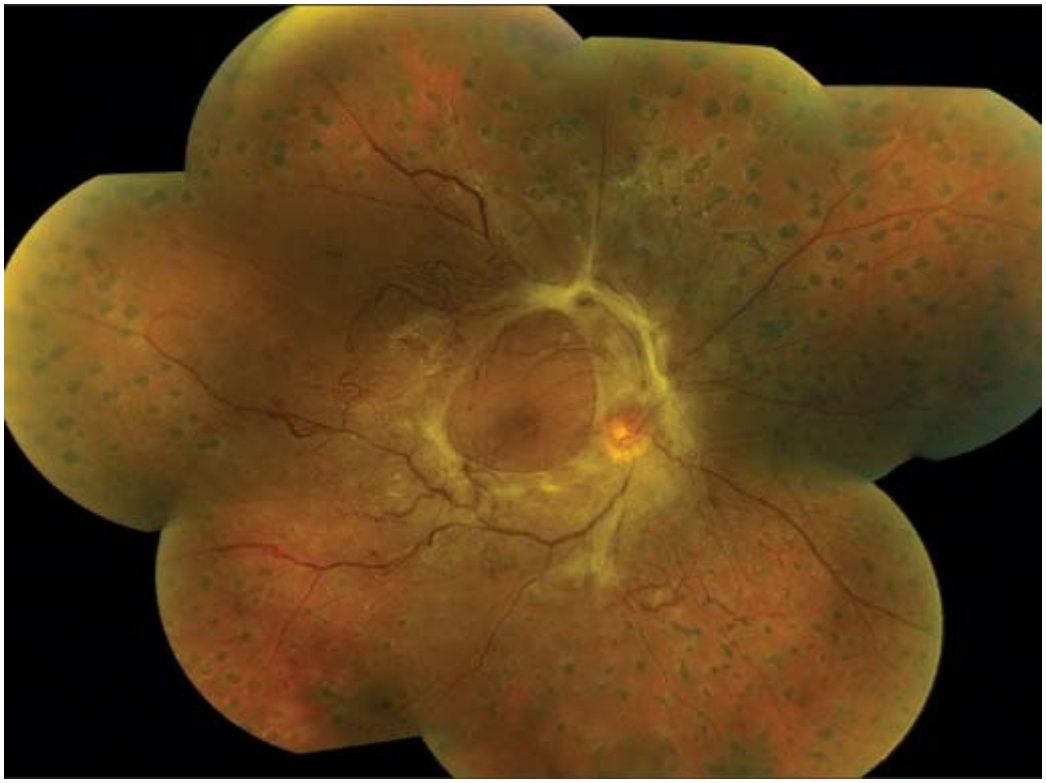


NVE > 1/2 of the DD

High Risk PDR



ADED



6. DIABETIC MACULAR EDEMA

Diabetic macular edema is defined as hard exudates and retinal thickening involving the macular area. Macular edema affects visual function through 2 mechanisms:

i) Increased intraretinal vascular permeability, resulting in macular edema

ii) Intraretinal capillary closure, resulting in macular ischemia

Factors that initiate macular edema include duration of diabetes, poor diabetic control, arterial hypertension, hyperlipidaemia, and diabetic nephropathy.

INTERNATIONAL CLINICAL DIABETIC MACULAR EDEMA DISEASE SEVERITY SCALE[8]:

2 major levels, with subcategories for diabetic macular edema.

Table 1

Proposed disease severity level	Findings observable upon dilated ophthalmoscopy
Diabetic macular edema absent	No retinal thickening or hard exudates in the posterior pole
Diabetic macular edema	Some retinal thickening or hard exudates in the posterior pole

If diabetic macular edema is present, it can be categorized as follows :

Table 2

Category	Findings observable upon dilated ophthalmoscopy.
Mild diabetic macular edema	Some retinal thickening or hard exudates in the posterior pole but distant from the macula
Moderate diabetic macular edema	Retinal thickening or hard exudates approaching the centre of the macula but not involving the centre
Severe diabetic macular edema	Retinal thickening or hard exudates involving the centre of the macula

CLINICALLY SIGNIFICANT MACULAR EDEMA:

The ETDRS defined clinically significant macular edema (CSME) and recommended treatment with focal laser photocoagulation for the following:

i) Retinal edema located at or within 500 micron of the center of the macula

ii) Hard exudates at or within 500 micron of the center if associated with thickening of adjacent retina

iii) A zone of thickening larger than 1 disc area if located within 1 disc diameter of the center of the macula

DIABETIC MACULOPATHY:

Diabetic maculopathy[5] may be classified by fluorescein angiography into

i) Focal (subdivided into focal exudates and focal/multifocal oedema),

ii) Diffuse

iii) Ischaemic and

iv) Mixed maculopathy

i)FOCAL MACULOPATHY:

Focal leakage occurs from microaneurysms or dilated retinal capillaries with extravascular lipoprotein in a circinate pattern around the focal leakage. If the areas of leakage, thickening, hard exudates within 500 micron from the centre of fovea, central vision is affected. Focal laser is the treatment of choice.

ii) DIFFUSE MACULOPATHY:

Occurs by generalized breakdown of the blood–retinal barrier and leakage from the entire capillary bed with cystoid macular changes. It represents a sudden decompensation of retinal capillaries.

There are 2 types.

a) Central diffuse

b) Generalised diffuse

Central diffuse diabetic macular edema:

This is characterized by leakage of the capillaries immediately adjacent to the foveal arcade. Cystoid edema is frequently seen.

Generalised diffuse diabetic macular edema:

This is characterized by widespread retinal thickening across the posterior pole, extending far beyond the fovea. This is often bilateral. Visual acuity is worse than 6/18.

iii) ISCHAEMIC DIABETIC MACULOPATHY:

Ischaemic maculopathy is due to macular capillary non-perfusion with enlargement of foveal avascular zone. Visual loss is disproportionate to

ophthalmoscopic findings. This can be divided into central and peripheral patterns.

a) Central ischaemic diabetic maculopathy:

Here the ischaemia starts at the fovea and spreads in a centrifugal manner, involving greater areas of the retina. There is severe visual loss. Microaneurysms are seen at the peripheral extent of the closure.

b) Peripheral ischaemic diabetic maculopathy:

There is peripheral capillary non-perfusion which extends to the posterior pole. The ischaemia is more irregular around the fovea with the area temporal to the fovea involved preferentially.

iv) MIXED DIABETIC MACULOPATHY

This has features of more than one type of maculopathy. Visual acuity is generally poor.

7. ROLE OF FFA IN DIABETIC RETINOPATHY

Chao and Flocks gave earliest description of FFA in 1958. Novotony and Avlis introduced this into clinical use in 1961[9].

FFA is a fundal photography, performed in rapid sequence following intravenous injection of 5ml of 10% fluorescein. Normally the arm to retina time i.e; time interval between dye injection and arrival of dye in the short ciliary arteries is 10-15 seconds. Choroidal circulation precedes retinal circulation by 1 second. Transit of dye through the retinal circulation takes approximately 15-20 seconds.

Hypofluorescence is reduction or absence of normal fluorescence. It is seen in major 2 patterns- blocked fluorescence and vascular filling defects. Hyperfluorescence is appearance of areas of enhanced visualization of a normal density fluorescein in the fundus due to window defect or an absolute increase in the fluorescein content of the tissues due to pooling of dye, leakage and staining of tissue.

Indications of FFA in DR:

i) In detecting CSME which is not clinically obvious

ii) Macular ischaemia

iii) In investigating asymmetric DR

iv) To differentiate IRMA and NVE

v) Differentiating ischaemic from exudative diabetic maculopathy

vi) Locating area of oedema for laser treatment

vii) Featureless retina

viii) To differentiate diabetic papillopathy from AION and NVD

Salient findings:

The two most important phases of FFA in diabetic retinopathy are the mid arteriovenous phase and late venous phase.

a) AV phase:

i) Capillary non-perfusion (CNP) areas outside the arcades and foveal avascular zone.

ii) Foveal avascular zone changes in DR include irregularity of FAZ margins, capillary budding into FAZ, widening of intercapillary spaces in perifoveal capillary bed, enlargement of FAZ (normal diameter is 500 micron) which are indicators for poor prognosis for vision.

iii) Leaking microaneurysms – many more than clinically evident are seen and can be differentiated from dot haemorrhages

iv) IRMA and new vessels are seen at the borders of CNP areas . The former leak minimally and the latter profusely

b) Late phase:

Emphasizes

i) Leakage from micoaneurysms (hyperfluorescent dots)

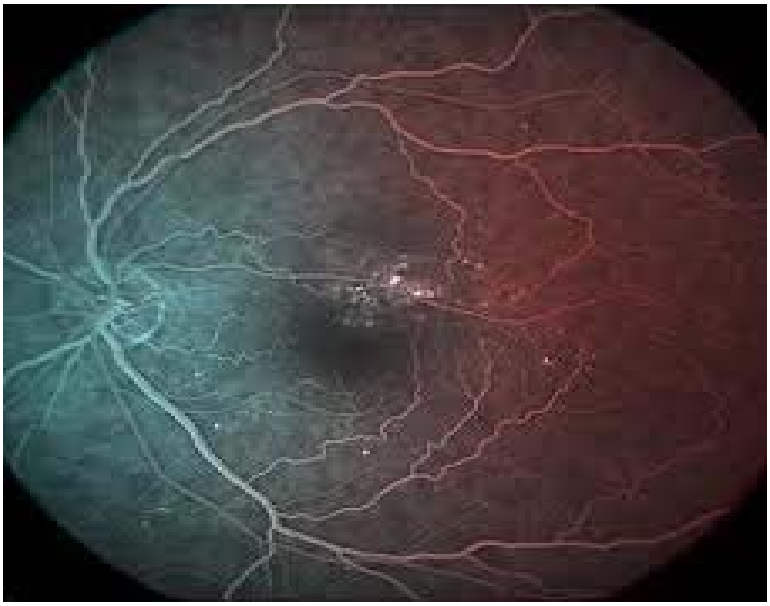
ii) Leakage from NVD/ NVE

iii) Well outlined CNP areas

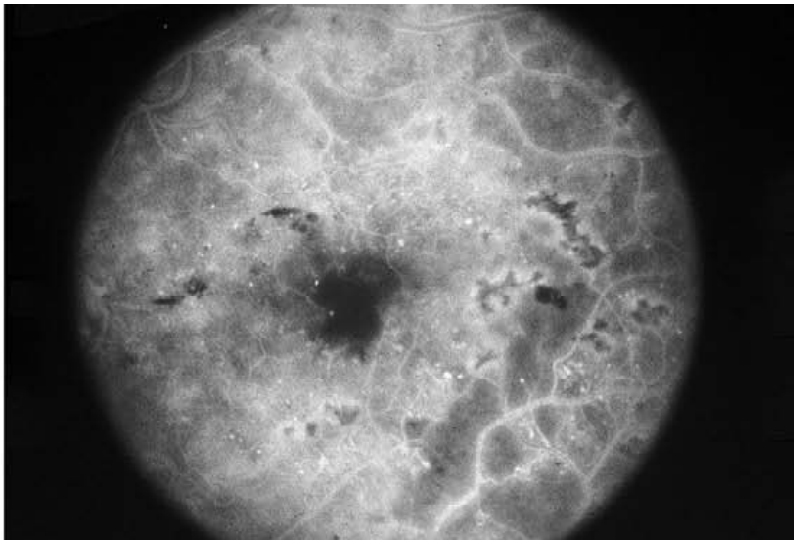
iv) Well outlined pre-retinal haemorrhages.

v) Blocked fluorescence of cotton wool spots.

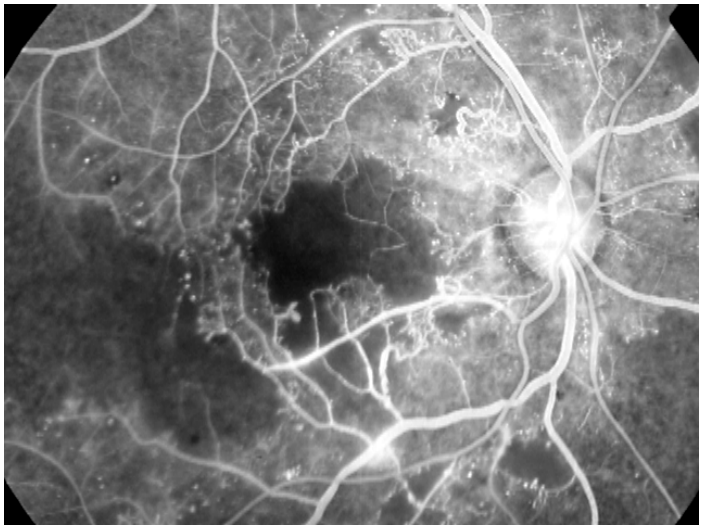
Focal Maculopathy



Diffuse Maculopathy



Ischaemic Maculopathy



8. OCT IN MACULAR EDEMA

OCT, first described by Huang et al[10] in 1991, is an imaging modality which provides high-resolution cross-sectional images of the neurosensory retina. OCT is noninvasive and helps us to detect, quantify and classify diabetic macular edema. It supplements the information obtained from ophthalmoscopy and fluorescein angiography. Macular edema is a common cause of moderate vision loss in patients with DR and can occur in any stage of the disease.

In focal edema, OCT shows areas of thickened and hyporeflective retina.

In diffuse macular edema, the retina becomes thicker and less reflective, with numerous small, irregular cavities reminiscent of spongy fabric and the foveal depression finally disappears.

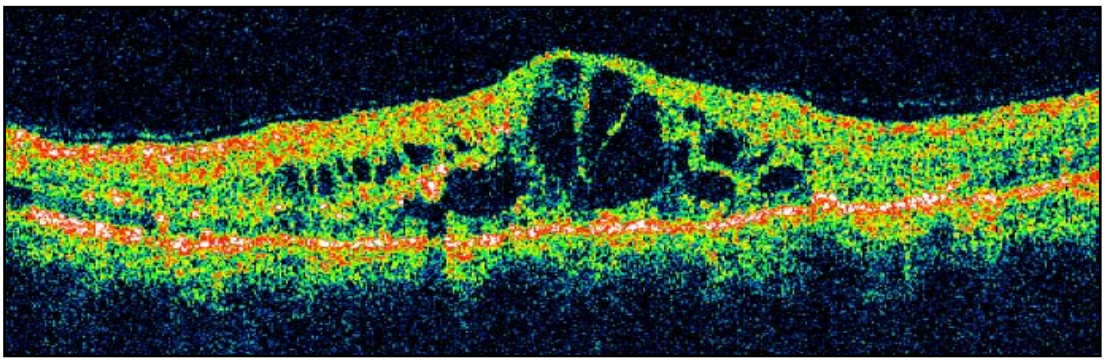
If retinal edema persists, necrosis of the Müller cells occurs, leading to cystoid cavities in the retina which start in the external plexiform layer showing hyporeflective cavities on OCT

A serous detachment of the macula in OCT is seen as a hyporeflective area under the macula elevating the neurosensory retina. The visual acuity significantly correlates with central foveal thickness measured by OCT.

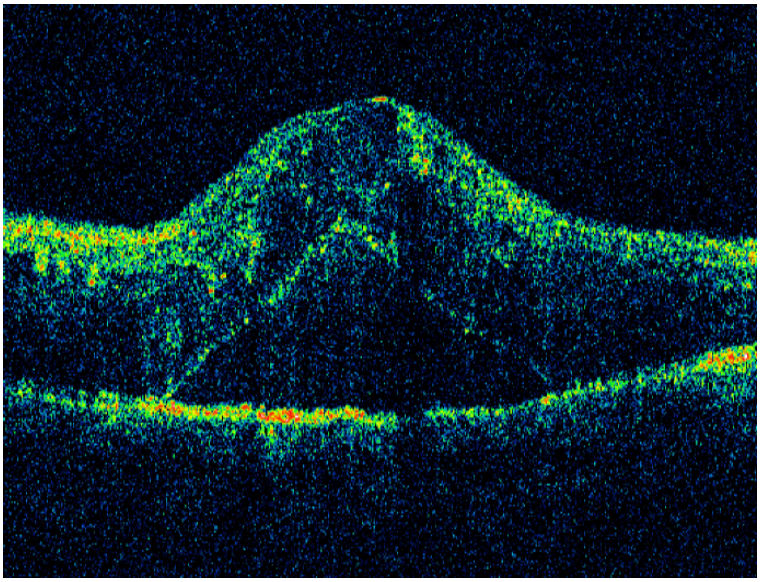
Yang et al. found a significant correlation between OCT and fluorescein angiography in CSME and categorized it into four types:

Type 1- Thickening of the fovea with homogenous optical reflectivity throughout the whole layer of the retina.

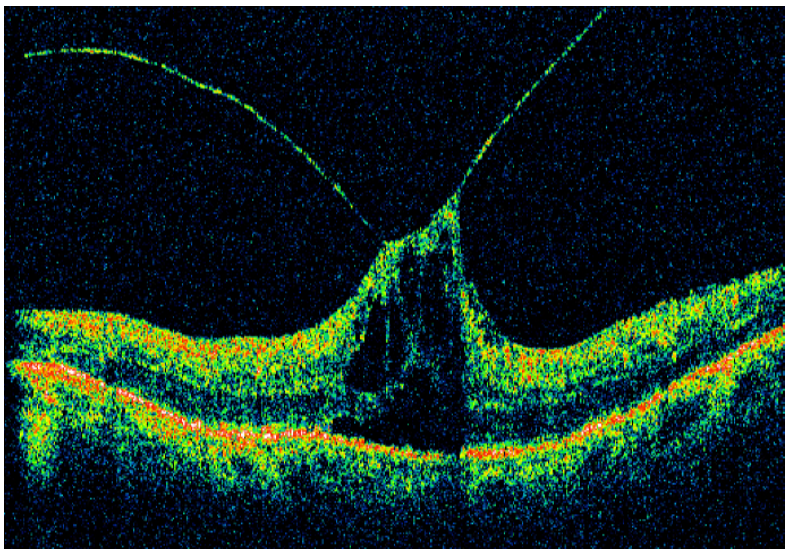
Cystoid macular edema (Type 2)



Type 3A



Type 3B



Type 2- Thickening of the fovea with markedly decreased optical reflectivity in the outer retinal layer.

Type 3- Thickening of the fovea with subfoveal fluid accumulation and distinct outer border of detached retina, type 3A, without vitreofoveal traction, and type 3B, with vitreofoveal traction.

There are 5 distinct patterns of diabetic macular edema in OCT –**1)** Sponge like thickening of retinal layers - confined to the outer retinal layers due to backscattering from intraretinal fluid accumulation. **2)** Cystoid macular edema - large cystoid spaces involving variable depth of retina with intervening normal tissue and confined, **3)** Subfoveal serous detachment – increased macular thickening of 480μ in the foveal centre with hyporeflective areas corresponding to cysts in the retina with subfoveal serous detachment , **4)** Tractional detachment of fovea – foveovitreal traction may result in detachment of fovea, and **5)** Taut posterior hyaloid membrane – results in recalcitrant macular edema with foveal detachment and diagnosed clinically as taut, shiny, glistening membrane. Patterns 4 and 5 are definite indications of vitrectomy. Patterns 2 and 3 are relative indications where PPV is indicated only if the cystoid edema or serous detachment was a result of co-existing mechanical traction.

9. TREATMENT OF DIABETIC MACULAR EDEMA

A)Lasers:

- Direct treatment of leaking microaneurysms
- Combination scatter laser photocoagulation and focal laser photocoagulation for DME in selected cases of severe NPDR and in eyes with PDR

Focal burns to microaneurysms:

- Spot size: 50-100 micron
- Duration: 0.05-0.1 sec
- Preferred end point: Whitening or darkening of microaneurysm.

Grid pattern of burns:

- Spot size: 50-200 micron
- Duration: 0.05-0.1 sec
- Preferred end point: Mild RPE whitening
- Grid treatment is not placed within 500 micron of the centre of the macula or within 500 micron form the disc margin.

  Grid treatment can extend up to 2 disc diameters from the centre of the macula

Mechanism of action of laser photocoagulation:

- Direct closure of leaking microaneurysms (laser induced endovascular thrombosis)
- Thermally damaged RPE alters outer BRB (favouring fluid movement from retina to choroid)

- Laser induced destruction of photoreceptors increases inner retinal oxygenation.
- A reduction of the leaking retinal capillary area in the zone of laser photocoagulation occurs resulting in the resolution of the macular edema (for a given capillary permeability and hydrostatic pressure).
- Autoregulatory vasoconstriction due to the improved retinal oxygenation improves DME.

Subthreshold Micropulse Diode Laser Photocoagulation (SMDLP)[11]:

- Also known as 'R 2 Laser'
- Micropulse laser (810 nm, 100 micro seconds) produces multiple short exposure burns for very short duration, which selectively damages the RPE cells without significantly affecting the outer retina and choriocapillaries.

Frequency - doubled Nd:YAG laser:

It offers the potential of less destructive retinal effect with lesser energy with barely visible burns at the level of RPE. Pattern scan laser (Pascal) uses frequency- doubled micropulse YAG in single shot mode or in a predetermined array of upto 56 shots applied in less than a second[12].

B) CORTICOSTEROID INJECTION:

Agents used are Triamcinolone (TCA), Fluocinolone and Dexamethasone. Can be given as intravitreal, posterior sub-Tenon and periocular injections.

Mechanism of action

- Stabilize BRB
- Downregulate VEGF.

The therapeutic effect of the steroid is typically seen within 1 week, but re-injections are needed every three to six months.

a) Triamcinolone Acetonide[13]:

- Synthetic Steroid (9- Flouro-16-Hydroxy Prednisolone)
- Good results in DME refractory to LASER treatment.
- 4 mg in 0.1ml
- Maximum effect is seen in 1 week and action persists for 3 months
- Mechanism of action :
    - Blocks release of arachidonic acid from cell membrane
    - Alters hydrostatic dynamics in the macula

b) Fluocinolone acetonide:

- Retisert[13] (Fluocinolone acetonide) is a surgical nonbiodegradable intravitreal implant (0.59 mg) designed to release active steroid within the posterior segment over approximately 1,000 days.
- FDA-approved for chronic macular edema due to uveitis.
- Surgically implanted through pars plana incision

c) Medidur:

- The Medidur implant (injectable implant) is a small device designed to be injected in an office setting.
- Advantages:
    - No potential side effects as due to systemic steroids
    - Avoids the need of repeated periocular or intravitreal injections

d) Dexamethasone implant:

- A biodegradable extended release intraocular implant which delivers dexamethasone at constant therapeutic levels by implantation into the posterior segment.
- Delivers drug for 4 –6 wks; 350 mcg, 700 mcg
- Requires an incision of 1 mm in pars plana or can be injected.
- Inserted by 19 Gauge Grieshaber Cannula
- No need to suture to sclera.
- After 1 month, implant further degrades and disappears in 3-6 months.

Complications of intravitreal steroids:

The complications include Glaucoma (requiring Filtering surgery), cataract, retinal detachment, choroidal detachment, vitreous haemorrhage, endophthalmitis, vitreous loss, intraocular inflammation and wound dehiscence.

C) Anti-VEGF THERAPY:

VEGF Antibodies:

- ❖ VEGF induces angiogenesis by serving as a potent endothelial cell mitogen.
- ❖ Secreted by hypoxic RPE cells and induces endothelial cell proliferation and retinal vascular permeability
- ❖ Anti-VEGFs act by targeting a VEGF protein and blocks the growth of new blood vessels, slow their leakage and slow down vision loss.
- ❖ Currently three drugs are used - Ranibizumab, Bevacizumab and Pegaptanib.

- Alternative splicing results in 5 isoforms :

  --VEGF-A → 121, 145, 165, 189 & 206 (the number corresponds to number of amino acids)

  --VEGF→B, C, D, E.

- VEGF-A simply known as VEGF

  VEGF is expressed by retinal pigment epithelial cells, endothelial cells and macrophages. It stimulates angiogenesis, inflammation, vascular permeability.

  Hypoxia and increased metabolic stress causes Hypoxia-Induced Transcription Factor (HIF) activation. Hypoxia response element (HRE) gene is transcribed, which stimulates production of proangiogenic factors →VEGF

  VEGF Receptors:

- VEGFR-1, 2 & 3
- VEGFR-1 : Cell migration
- VEGFR-2 : Differentiation & translocation of endothelial cells
- VEGFR-3 : Involved in lymphatic system
- VEGF165- Heparin-binding, 45kDa glycoprotein secreted in matrix and bound formsand is responsible for pathologic neovascularization in the eye.

i) Ranibizumab:

- Ranibizumab has a molecular weight of 48 kDa

  - produced by an *E. coli* expression system in a nutrient medium containing tetracycline.

-Six amino acids were substituted to improve the fragments ability to bind VEGF.

- Recombinant, humanized fragment of a mouse monoclonal IgG antibody
- It has antigen binding sequence which binds & inhibits all isoforms of VEGF-A receptors on endothelial cell
- It is a sterile, colourless to pale yellow solution supplied as a preservative-free sterile solution with pH 5.5.
- Administered by intravitreal injection 0.5 mg once a month initially
- Reduced to 1 injection every 3 months after the first 4 injections.
- Dosing every 3 months will lead to an approximate 5-letter (1-line) benefit on average over 9 months.

ii) Bevacizumab:

- Produced in Chinese Hamster Ovary mammalian cell expression system in a nutrient medium containing gentamicin
- Mol wt -149 KDa
- Developed, approved and licensed for intravenous infusion in the treatment of colorectal carcinoma.
- Full length antibody which triggers complement mediated or cell mediated cytoxicity through inflammatory cells via the Fc (cell binding) part of the IgG molecule.
- It is a clear to slightly opalescent, colourless to pale brown solution with pH 6.2

- ❖ It is supplied in 100 mg and 400 mg, single-use vials and useful in the short term for limiting visual loss
- ❖ Its intraocular use is off label

iii) Pegaptanib:

- ❖ 1st aptamer approved for therapeutic use in man.

Aptus= to fit (Latin)

Meros= part or region (Greek)

1st anti AVEGF drug approved in 2004 in US.

Pegaptanib is a large oligonucleotide molecule consisting of a 28 base ribonucleic acid combined with a 40 kDa polyethylene glycol moiety (pegylation) which is rendered less suseptible to nucleases

Mechanism of action → molecule binds with high affinity to VEGF 165 preventing activation of ocular VEGF receptors and thus angiogenesis.

iv) Protein Kinase C Inhibitors - LY333531 also called Ruboxistaurin (32 mg/day). It is an antagonist of Beta subunit of protein kinase C and suppresses the VEGF mediated responses. It is administered orally[13].

v) VEGF Trap:

- ❖ VEGF-Trap (R1R2) is a fusion protein that combines ligand binding elements taken from the extracellular domains of VEGFR-1 and VEGFR-2 fused to the Fc portion of IgG.
- ❖ Given as intravitreal injection.

vi) SiRNA:

SiRNA is a double-stranded piece of interference RNA taken up by chorioretinal cells which breaks down the antisense mRNA and prevents the production of VEGF protein(catalytic).

- ❖ Produces very potent and efficient blockade of VEGF
- ❖ Has long half-life and currently being tested in clinical trials

Complications of intravitreal injection of anti-VEGF:

i) Cataract

ii) Glaucoma

iii) Vitreous haemorrhage

iv) Endophthalmitis

v) Retinal detachment.

D) NSAIDs:

Nepafenac is a prodrug that is converted into amfenac in the eye[14.] Bromfenac is an another topical NSAID[15]. Both are used as eye drops in the treatment of macular edema.

E) Pars plana vitrectomy:

Based on both clinical examination and OCT findings, Pars plana vitrectomy (PPV) is done for removal of VMT. The posterior hyaloid is removed along with any posterior cortical vitreous strands to the foveal edge and any visually significant epiretinal membrane. Central subfoveal thickness is reduced to < 250 micron in 50% of eyes. As per the DRCR net study, only 28%-49% of

such eyes have improvement of visual acuity and 13%- 31% have worsening of visual acuity[16].

F) Others*:*

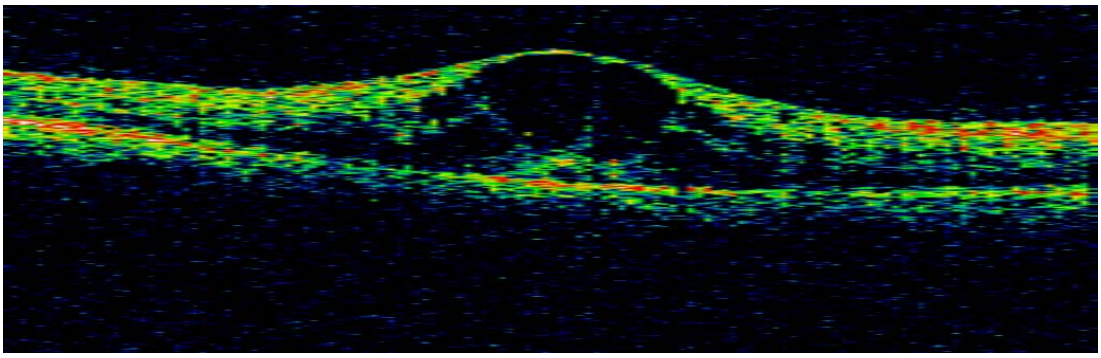
i) ***Bevasirinab*** utilizes SiRNA technology to target the mRNA of VEGF, not the VEGF molecule itself

ii) ***Sirolimus*** - antiangiogenic, immunosuppressive and antiproliferative activity

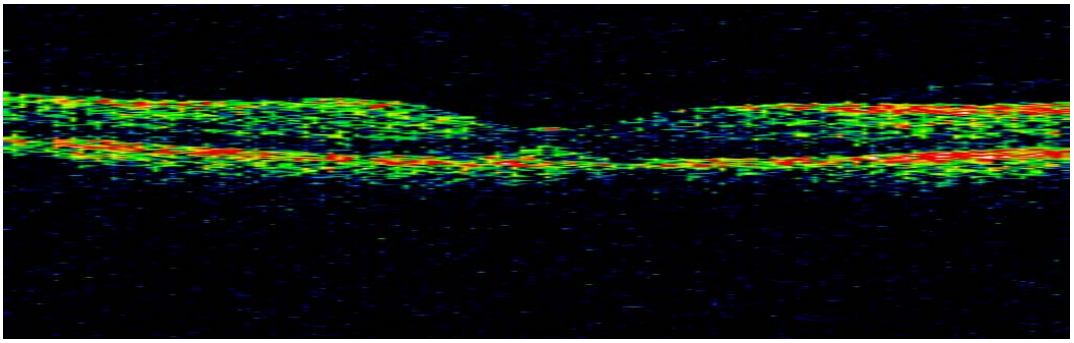
iii) **Fenofibrate -** is a fibric acid derivative and is used to reduce serum lipids.

iv) **Candesartan** (angiotensin receptor blocker) may be useful in diabetic macular edema since it is proposed that renin - angiotensin system plays a role in DME[13].

Macular edema - pre treatment



Macular edema - post treatment with Bevacizumab



10. FOLLOW-UP SCHEDULE[8]

TABLE 3

DR stage	No macular edema	With macular edema	With CSME
Mild NPDR	12 mo FU	4-6 mo FU	FA + Focal laser 2-4 mo FU
Moderate NPDR	*6-8 mo FU*	*4-6 mo FU*	FA+*Focal laser* *2 – 4 mo FU*
Severe NPDR	3-4 mo FU Rarely PRP	Focal laser, Occasionally PRP 2-3 mo FU	FA Focal laser, occasionally PRP 2-3 mo FU
Very severe NPDR and Non-high risk PDR	Occasionally PRP 2-3 mo FU	Focal laser, Occasionally PRP 2-3 mo FU	FA Focal laser, Occasionally PRP 2-3 mo FU
High risk PDR	PRP 2-3 mo FU	FA Focal laser+ PRP 1-2 mo FU	FA Focal laser+ PRP 1-2 mo FU

** FU- Follow up*

11. AIM OF THE STUDY

To determine the prevalence of diabetic maculopathy , prevalence of the found type of maculopathy and correlation with the stage of diabetic retinopathy.

PURPOSE OF THE STUDY

To study the correlation between the type of diabetic maculopathy and the stage of diabetic retinopathy and to study the effect of diabetic maculopathy treatment in an ambidirectional cohort setup.

MATERIALS AND METHODS

SOURCE OF DATA

Diabetic retinopathy patients who fulfill the inclusion and exclusion criteria attending the outpatient department at Tirunelveli medical college hospital during the study period.

METHODS OF COLLECTION OF DATA

SAMPLE SIZE: 100 patients (convenient sample size)

INCLUSION CRITERIA:

All patients with diabetic retinopathy

EXCLUSION CRITERIA:

i)Narrow angles ii) Media opacities which preclude fundus examination iii) Patients already treated for diabetic retinopathy.

STUDY DESIGN:

Bidirectional cohort observational study

METHODOLOGY:

i. Informed consent

ii. Detailed history regarding the age, duration of diabetes, treatment of diabetes, hypertension, dyslipidemia

iii. Stage of diabetic retinopathy according to Early Treatment Diabetic Retinopathy Study (ETDRS) grading system

iv. Type of maculopathy documented using fundus fluorescein angiography

v. Treatment, follow up and effect of treatment based on visual acuity

vi. Correlation of diabetic maculopathy and diabetic retinopathy was tested statistically

vii. Risk factors for diabetic retinopathy and diabetic maculopathy were studied

viii. Visual outcome of treatment for diabetic maculopathy was correlated with the stage of diabetic retinopathy

OUTCOMES

Primary outcome: Correlation of type of diabetic maculopathy with the stage of diabetic retinopathy

Secondary outcome: Risk factors for diabetic maculopathy and diabetic retinopathy

Tertiary outcome: Effect of diabetic maculopathy treatment quantified by visual acuity

12. REVIEW OF LITERATURE

Incidence &prevalence:

In 1952, **Joslin et al**. reported that diabetes mellitus occurs commonly in people in the 5th and 6th decade of life and 50% appear between the ages of 40 and 50 years , only 5% in the first decade and 3% in the eighth decade[1] .

Kornerup in 1957 found 47% of patients with diabetes were having diabetic retinopathy[1].

In 1954, **Dollfus** found 52.4% of unselected diabetics had diabetic retinopathy[1]. **Babel** and **Rilliet** in 1958 and **Larsen** (1960) observed increased incidence in diabetic retinopathy.

In 1984, **Klein R, Klein BEK , Moss SE et al**, in their classic Wisconsin Epidemiological Study[17] of diabetic retinopathy found that prevalence of DR in type 2 DM who were diagnosed at less than 30 years of age was 17% in 5 years and 98% in 15 years duration . Background DR was found in 18% of diabetics in 5 years, 71% within 10 years and 69% in 15 years and 42% with atleast 30 years duration. PDR was found in none of the patients with less than 5 years duration, 4 % in 10 years duration, 25% in 15 years, 57% within 30 years and 67% in 35 years[18]. Macular edema was present in 2% to 6% of patients with BDR, 20% to 63% in patients with pre-proliferative diabetic retinopathy and 70 to 74% in patients with PDR. There was an increased prevalence of macular edema with a longer duration of diabetes mellitus, higher glycosylated haemoglobin level and proteinuria[18].

In older onset diabetics (age of 30 years or more), diabetic retinopathy was found to be higher in IDDM than NIDDM . BDR was found in 35% of patients with NIDDM and in 56% with IDDM. PDR was seen at an earlier age in IDDM than NIDDM. Macular edema was more common with IDDM (15%) than NIDDM (4%). Progression of NPDR to PDR is more common with IDDM than NIDDM and a linear relationship with duration of diabetes is confirmed. The incidence of macular edema also correlated with a longer duration of DM and a higher glycosylated haemoglobin at the baseline examination[18].

RISK FACTORS

The best demographic study of patients with NIDDM was reported in 1983 by **Yanko** and associates[19].

Wisconsin epidemiological study in 1984 also found a linear relationship between duration of diabetes and severity and progression of DR[10].

With Intensive blood glucose control, 76% risk reduction in onset of retinopathy, 47% risk reduction in the progression of severe NPDR or PDR, 23% risk reduction of CSME and 56% reduction in the need for laser treatment[20].

Hypertension is common in 30% of people with younger onset diabetes mellitus and 75% with older onset diabetes mellitus. American diabetes association has suggested target for systolic and diastolic blood pressure level as <130mm of Hg and <85 mm of Hg respectively[21]. UKPDS study showed that the blood pressure lowering rather than the type of medication was important in people with diabetes and hypertension[22].

UKPDS study stated that control of systemic hypertension reduce the risk of new onset DR and slow the progression of existing DR. With tight blood pressure control, 35% risk reduction for the need for retinal photocoagulation, 34% risk reduction for progression of retinopathy, 34% risk increase for the need for cataract extraction, 24% risk reduction for the development of vitreous haemorrhage and 29% risk reduction for the development of legal blindness[22].

In 1932, **Feldman** found that 35% diabetics with symptomatic DR had proteinuria, elevated levels of blood urea nitrogen (BUN) or elevated levels of creatinine[23]. In 1980, **West** found that 58% of severe retinopathy had proteinuria[24]. In 1982, Bodansky in his case control study found elevated levels of creatinine in patients with severe retinopathy, but not in patients with long standing diabetes and no retinopathy[25].

Klein R and associates in 1984 in their Wisconsin study reported that prevalence of DR is better predicted by proteinuria than the duration of DM in patients who were diagnosed before the age of 30 years and who had diabetes for more than 10 years[17].

In 1985, **Barnett AH** and associates have shown that patients with even minimal quantities of albumin in the urine (microalbuminuria) are at high risk of developing retinopathy[26].

In 1957, **Kornerup** in his study concluded that raised blood pressure is by no means an essential factor in the etiology of DR[27]. **Rand** in 1984 found that more patients with PDR were on antihypertensive therapy than without

retinopathy[28]. **Murphy** in 1984 found that retinopathy progressed more rapidly in patients with systemic hypertension than in those without it[29].

Biljana et al reported that elevated serum lipids are associated with macular edema and moderate visual loss. Elevated serum lipids, particularly total cholesterol / HDL ratio and triglycerides are risk factors for both CSME and retinal hard exudates[30]. Elevated total cholesterol, high density lipids and triglycerides were associated with faster development of hard exudates[7]. **Davis MD** reported that elevated triglycerides at baseline is a risk factor for PDR[31].

John M.Sparrow in his study concluded that risk factors for retinopathy and or maculopathy included longer diabetes duration, female sex, high blood pressure, the use of antihypertensive drugs and cigarette smoking[32].

Muhlhauser and Sawicki et al suggested an association of smoking with progression of DR[33]. Later **Muhlhauser** reviewed the study and concluded that the association of smoking is less consistent with retinopathy[34].

Davis MD reported that low haematocrit was an independent risk factor in development of high risk PDR and of severe visual loss[31]. **Shorb SR et al** concluded that there was rapid progression of NPDR to PDR with severe iron deficiency anaemia of various etiologies[35].

In 1952, **White P** and associates found that 25% of patients with PDR had significant vitreous haemorrhages during pregnancy[36]. **Johnston** in 1980 used Xenon arc photocoagulation to treat 43 eyes of pregnant women with PDR. Eighty percent of these retained 6/12 vision or better[37].

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Golubovic- Arsovska et al stated that diabetic maculopathy was most frequently found in preproliferative and proliferative diabetic retinopathy (93.6% and 95.3%). The prevalence of maculopathy in NPDR was 45%. The most frequent type of diabetic maculopathy was the mixed one(77.56%), followed by exudative maculopathy (39%), ischaemia(4%) and edematous(1%)[38].

MANAGEMENT

Ballantyne et al. in 1946, argued that incidence of DR bears no constant relationship with the seriousness of diabetes. However, **Jackson et al**. in 1950 found that severity of DR is less in well controlled diabetics compared to poorly controlled ones. Discovery of Insulin in 1921 and then oral hypoglycaemic drugs revolutionized the treatment of diabetes[1].

Esmann and colleagues in 1963 and **Mooney** in 1963 claimed that, the waxy retinal exudates disappeared using para- amino salicylic acid in few cases[1].

Hormonal therapy of various types as well as pituitary ablation have been tried in the treatment of DR (**Houssay and Blasotti** - 1930). However side effects were more than benefits. Radiation therapy was used to alleviate PDR (**Imre** - 1963), but not proved successful[1].

Use of photocoagulation for treatment for DR started a new chapter in the management of DR.

Review of literature of photocoagulation for diabetic retinopathy:

Treating PDR by focal treatment to disc and peripheral neovascularisation and PRP showed variable results (1960- 1976). Ruby laser was ineffective at

directly closing flat revascularization, although the xenon and argon lasers afforded better success due to better haemoglobin absorption.

From 1972-1975, Diabetic Retinopathy Study (DRS) and in 1977 **Hercules et al**[39] and in1984, **British Multicenter Study Group**[40] conclusively showed that PRP was an effective treatment for PDR. DRS concluded that PRP reduces the risk of severe visual loss by atleast 50%. Argon and Xenon photocoagulation were equally effective in preventing severe visual loss and also noted the aggravation of macular edema following PRP. ETDRS study concluded that scatter photocoagulation should be considered when retinopathy is more severe and should not be delayed until the eye reaches high risk proliferative stage.

In 1993, **Krypton Argon Regression of Neovascularisation Study (KARNS)** found that the beneficial effects of PRP were independent of the wavelength used[42].

Olk et al. 1986 and 1991 found that argon blue green modified grid laser photocoagulation for diffuse diabetic maculopathy effectively prevented visual loss and improved or stabilized vision. The visual prognosis was not affected by cystoid macular edema, poor baseline vision, or a history of hypertension or systemic vascular disease. Longterm visual results with 2-9 years of follow up confirmed the effectiveness of modified grid laser.

ETDRS showed 1) 50% or greater reduction in the rate of MVL in laser treated eyes with CSME. 2) Photocoagulation was of no benefit in eyes without CSME, as the risk of significant visual loss with or without treatment was small. The risk of significant visual loss was greatest when the macular centre was

involved or threatened by retinal thickening and associated hard exudates. It also reported that photocoagulation did not significantly improve vision. 3) Aspirin was not found to be beneficial in progression of DR.

DRS (Diabetic Retinopathy Study) demonstrated a ≥ 50% reduction in severe visual loss in PRP treated eyes in 5years follow-up[4].

RESOLVE study:

Safety and efficacy of Ranibizumab in diabetic macular edema study showed that gain of ≥10 letters BCVA from baseline occurred in 60.8% of ranibizumab treated eyes[43] at month 12. Mean CRT reduction was 194.2 ± 135.

RESTORE study:

This study concluded that Ranibizumab alone and combined with laser were superior to laser monotherapy in improving mean average change in BCVA letter score from baseline in 12 months[44].

BOLT study:

Intravitreal bevacizumab doses of 1.25 to 2.5 mg is beneficial in improving best-corrected visual acuity and in reducing macular thickness on OCT at 24 months in The Pan-American Collaborative Retina Study Group[16].

DRCRnet study:

The recent Diabetic Retinopathy Clinical Research Network (DRCR.net) study stated that ranibizumab combined with prompt/deferred laser photocoagulation provided superior benefits compared with laser treatment alone in DME[45]. It has suggested Ranibizumab injection at baseline with prompt laser, followed by monthly ranibizumab injections for 4 months followed by

continuation of injections at 16 weeks if the OCT central subfield thickness is >/=250μ with visual acuity worse than 20/20[16].

Jost B. Jonas concluded that IVTA+ laser was more effective than laser alone in pseudophakic eyes[46]. He showed that visual acuity in phakic eyes improved significantly in 81% during follow-up and intraocular pressure increased significantly from 16.9 ± 2.5 mmHg to a mean maximal value of 21.3 ± 4.7 mmHg, and decreased significantly to 17.7 ± 4.7 mmHg at the end of the study[47].

13. RESULTS

100 type II diabetes patients (200 eyes) with diabetic retinopathy in atleast one eye were studied. 1 patient was one eyed and 5 patients had DR in one eye only. I studied the prevalence of the various stages of diabetic retinopathy, prevalence of maculopathy and incidence of macular edema during the 6 month follow up period. The stages of DR were correlated with different risk factors with Kendall's tau test and maculopathy association was statistically done by Chi-Square test.

Table 4

Age Vs DR stage

Age group	DR stage							Total
	Mild NPDR	Moderate NPDR	Severe NPDR	Very severe NPDR	Early PDR	High risk PDR	ADED	
41-50	7	7	7	0	8	8	3	40
51-60	8	32	22	3	20	10	3	98
61-70	4	19	6	0	7	2	4	42
71-80	6	2	4	1	0	0	1	14
Total	25	60	39	4	35	20	11	194

Out of 194 eyes with DR, 40 were in the age group 41-50 years, 98 were in 51-60 years, 42 were in 61-70 years and 14 in age group 71-80. 52% of total

study population were in 51-60 age group. Mean age was 57.21 years and ranged from 41- 73 years.

Out of 25 eyes with mild NPDR, 7 were in 41-50, 8 were in 51-60 years, 4 were in 61-70 and 6 were in 71-80 age group. In 60 eyes with moderate NPDR, 7 were in the age group 41-50 years, 32 were in 51-60 years, 19 were in 61-70 years and 2 in age group 71-80. Out of 39 eyes with severe NPDR, 7 were in 41-50, 22 were in 51-60 years, 6 were in 61-70 and 4 were in 71-80 age group. In 4 eyes with very severe NPDR, 3 were in 51-60 years and 1 was in age group 71-80. In 35 eyes with early PDR , 8 were in 41-50, 20 were in 51-60 years and 7 were in 61-70. Among the 20 eyes with high risk PDR, 8 were in 41-50, 10 were in 51-60 years and 2 were in 61-70 age group. In 11 eyes with ADED, 3 were in the age group 41-50 years, 3 were in 51-60 years, 4 were in 61-70 years and 1 was in age group 71-80.

Table 5

Age Vs Maculopathy

Age group						**Total**
	No maculopathy	**Focal**	**Diffuse**	**Ischaemic**	**Mixed**	
41-50	21	3	7	4	5	40
51-60	29	17	55	2	0	103
61-70	15	11	16	0	0	42
71-80	5	5	4	0	0	14
Total	70	36	82	6	5	199

Out of 199 eyes studied, 70 had no maculopathy. Among the 129 eyes with maculopathy, 19 eyes were in 41-50 years, 74 in 51-60 years, 27 in 61-70 years and 9 in 71-80 age group.. Among 36 eyes with focal maculopathy, 3 were in 41-50, 17 in 51-60, 11 in 61-70 and 5 were in 71-80 age group. Out of 82 eyes with diffuse maculopathy, 7 were in 41-50, 55 in 51-60, 16 in 61-70 and 4 were in 71-80 age group. In 6 eyes with ischaemic maculopathy, 4 were in 41-50 and 2 in 51-60 age group. All 5 eyes with mixed maculopathy were in 41-50 age group. Diffuse maculopathy was the most common maculopathy found in this study and most common age group for maculopathy was 51-60 years.

Table 6

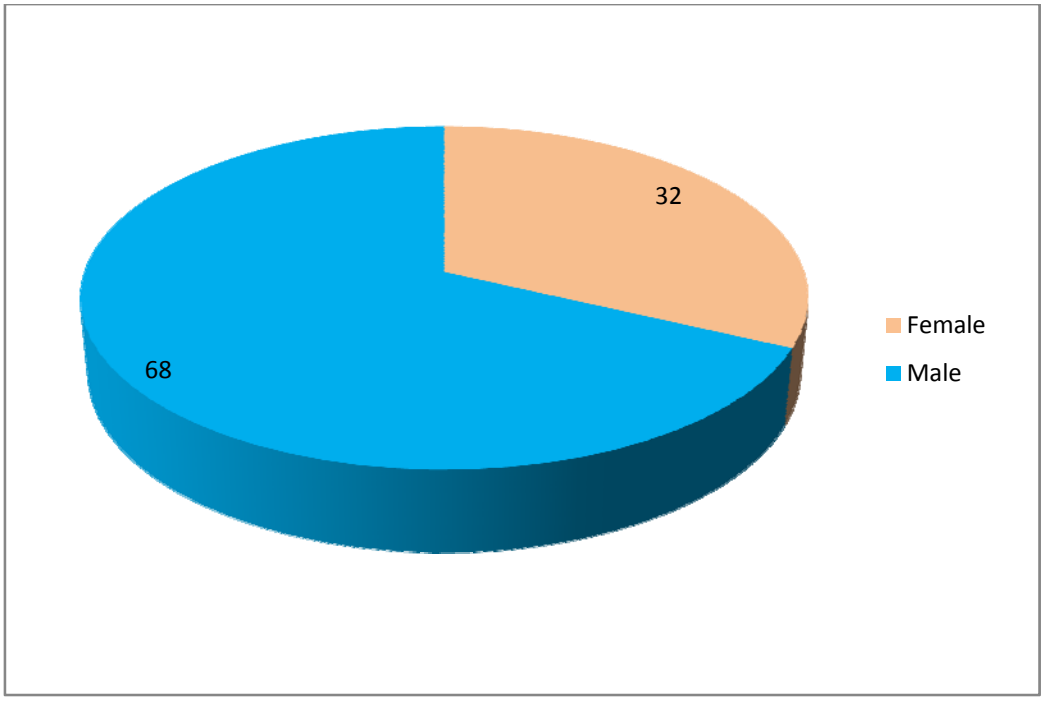
Sex Vs DR stage

Sex	**DR stage**								**Total**
	No DR	**Mild NPDR**	**Moderate NPDR**	**Severe NPDR**	**Very severe NPDR**	**Early PDR**	**High risk PDR**	**ADED**	
Male	1	16	44	29	3	28	5	9	135
Female	4	9	16	10	1	7	15	2	64
Total	5	25	60	39	4	35	20	11	199

Table 7

Sex Vs Maculopathy

Sex	Maculopathy					Total
	No maculopathy	Focal	Diffuse	Ischaemic	Mixed	
Male	40	28	63	4	0	135
Female	30	8	19	2	5	64
Total	70	36	82	6	5	199



Out of the 100 patients, 68 were males and 32 were females.

Table 8

Visit type Vs DR stage

Visit type	DR stage								Total	Correlation coefficient	P value
	No DR	Mild NPDR	Moderate NPDR	Severe NPDR	Very severe NPDR	Early PDR	High risk PDR	ADED			
Directly attending eye OP	5	23	60	39	4	34	19	11	195	-0.02	0.757
Referred	0	2	0	0	0	1	1	0	4		
Total	5	25	60	39	4	35	20	11	199		

*Kendall's tau test

Out of the 100 patients, only 2% were referred from other speciality outpatient departments.

Table 9

DR stage Vs Prevalence of maculopathy

DR stage	Maculopathy		Total	P value
	Yes	No		
No DR	0	5	5	0.002
Mild NPDR	14	11	25	
Moderate NPDR	48	12	60	
Severe NPDR	31	8	39	
Very severe NPDR	2	2	4	
Early PDR	22	13	35	
High risk PDR	8	12	20	
ADED	4	7	11	
Total	129	70	70	

*Pearson's Chi-Square test

Out of the 199 eyes , 129 had maculopathy. DR stage and prevalence of maculopathy had significant association.

Table 10

DR stage Vs Type of maculopathy

DR stage	Maculopathy					Total	P value
	No	Focal	Diffuse	Ischaemic	Mixed		
No DR	5	0	0	0	0	5	<0.0001
Mild NPDR	11	8	6	0	0	25	
Moderate NPDR	12	21	23	4	0	60	
Severe NPDR	8	3	24	1	3	39	
Very severe NPDR	2	0	2	0	0	4	
Early PDR	13	3	18	0	1	35	
High risk PDR	12	1	6	0	1	20	
ADED	7	0	3	1	0	11	
Total	70	36	82	6	5	199	

*Pearson's Chi-Square test

Among 25 eyes with mild NPDR, 8 had focal maculopathy and 6 had diffuse maculopathy. Among 60 eyes with moderate NPDR, 21 had focal maculopathy, 23 had diffuse type and 4 had ischaemic maculopathy. Out of 39 eyes with severe NPDR, 3 had focal maculopathy, 24 had diffuse type, 1 had ischaemic maculopathy and 3 had mixed maculopathy. 2 out of 4 eyes with very severe NPDR had diffuse maculopathy. out of 35 eyes with early PDR, 3 had focal type, 18 had diffuse maculopathy and 1 had mixed maculopathy. Among 20 eyes with high risk PDR, 1 had focal maculopathy , 6 had diffuse type and 1 had

mixed maculopathy. Among 11 eyes with ADED, 3 had diffuse and 1 had ischaemic maculopathy. Moderate NPDR and severe NPDR had maximum proportion among the study population of which diffuse maculopathy was the commonest. The progression of DR had significant association with type of maculopathy.

Table 11

DR stage Vs Incidence of macular edema

DR stage	Incidence of macular edema		Total	P value
	Yes	No		
No DR	0	5	5	0.009
Mild NPDR	0	11	11	
Moderate NPDR	4	6	10	
Severe NPDR	2	6	8	
Very severe NPDR	0	2	2	
Early PDR	0	13	13	
High risk PDR	0	12	12	
ADED	0	5	5	
Total	6	60	66	
Percentage	9.09%	90.91%	100%	

*Pearson's Chi square test

6 out of 66 eyes (9.09%) developed macular edema during 6 month follow up. Moderate NPDR and severe NPDR had developed macular edema during 6

month follow-up. DR stage and incidence of macular edema had significant association.

Table 12

DM duration Vs DR stage

DM duration in years	DR stage							Total
	Mild NPDR	Moderate NPDR	Severe NPDR	Very severe NPDR	Early PDR	High risk PDR	ADED	
0-5	9	20	10	2	7	4	5	57
6-10	5	15	13	0	13	6	5	57
11-15	5	10	5	2	9	6	1	38
16-20	4	11	7	0	4	4	0	30
21-25	0	4	0	0	2	0	0	6
>25	2	0	4	0	0	0	0	6
Total	25	60	39	4	35	20	11	194

* Kendall's tau test

*Correlation coefficient 0.015, P value 0.790.

Out of 194 eyes with DR, 57 had diabetes for 0-5 years, 57 had diabetes for 6-10 years, 38 had diabetes for 11-15 years, 30 had diabetes for 16-20 years and 6 had diabetes for 21-25 years and 6 had diabetes for more than 25 years. There was no significant correlation between DM duration and progression of DR.

DM Duration Vs DR stage

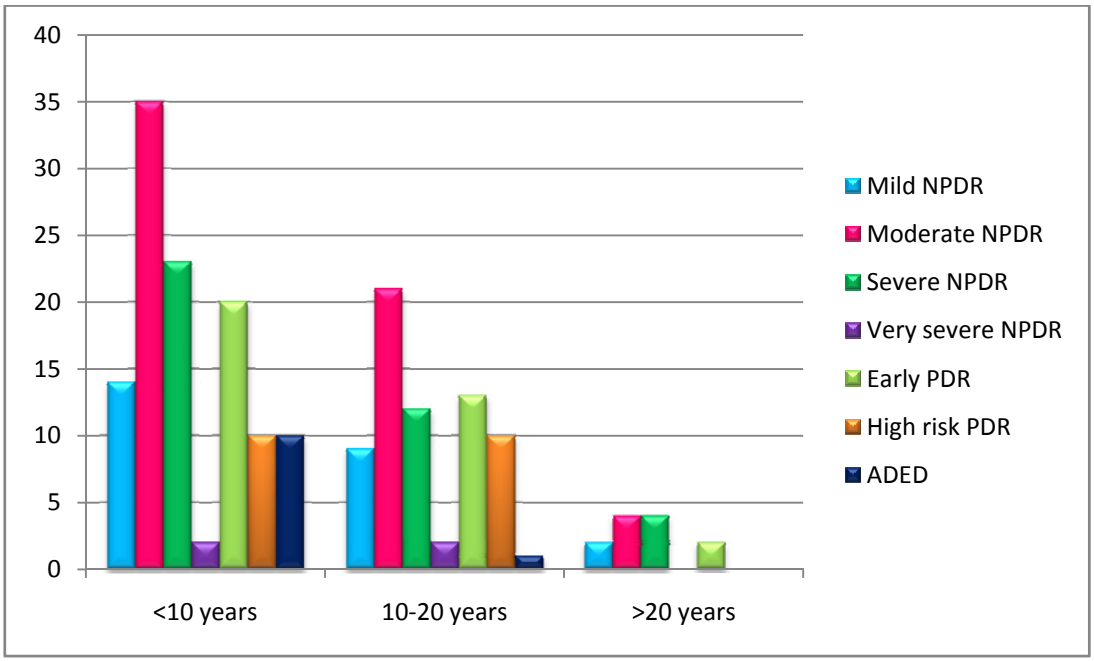


Table 13

DM duration Vs Maculopathy

DM duration in years	Maculopathy				Total	P value
	Focal	Diffuse	Ischaemic	Mixed		
0-5	6	21	2	0	29	0.119
6-10	16	14	2	3	35	
11-15	10	19	0	2	31	
16-20	3	20	2	0	25	
21-25	0	4	0	0	4	
>25	1	4	0	0	5	
Total	36	82	6	5	129	

*Pearson's Chi square test

Out of 129 eyes with diabetic maculopathy, 29 had diabetes for 0-5 years, 35 had for 6-10 years, 31 had diabetes for 11-15 years, 25 had diabetes for 16-20 years, 4 had diabetes for 21-25 years and 5 had diabetes for more than 25 years. There was no significant association between duration of diabetes and type of macuopathy

Table 14

DM duration Vs Incidence of macular edema

DM duration in years	Incidence of macular edema		Total	P value
	Yes	No		
0-5	4	23	27	0.763
6-10	2	22	24	
11-15	0	7	7	
16-20	0	5	5	
21-25	0	2	2	
>25	0	1	1	
Total	6	60	66	

*Pearson's Chi square test

Out of the 6 patients with development of macular edema, 4 had diabetes for 1-5 years and 2 had diabetes for 6-10 years.

Table 15

DM duration Vs Worsening of vision

DM duration in years	Worsening of vision		Total	P value
	Yes	No		
0-5	8	48	56	0.519
6-10	16	43	59	
11-15	10	27	37	
16-20	6	24	30	
21-25	2	4	6	
>25	2	4	6	
Total	44	150	150	

*Pearson's Chi square test

Out of the 194 patients with DR, 44 had worsening of vision. Maximum worsening was seen in 6-10 years.

Table 16

Hypertension Vs DR stage

Hypertension	DR stage							Total	%
	Mild NPDR	Moderate NPDR	Severe NPDR	Very severe NPDR	Early PDR	High risk PDR	ADED		
Yes	9	36	15	0	8	5	3	76	39.17%
No	16	24	24	4	27	15	8	118	60.82%
Total	25	60	39	4	35	20	11	194	100%

*Kendall's tau test

Correlation coefficient -0.213. P value 0.001

Among the 194 eyes with DR, 76 had concurrent hypertension which contributed to 39.17% of the study population. There was significant negative correlation between hypertension and progression of DR.

Table 17

Hypertension Vs Maculopathy

Hypertension	Maculopathy				Total	%	P value
	Focal	Diffuse	Ischaemic	Mixed			
Yes	18	35	1	2	56	43.42%	0.21
No	18	47	5	3	73	56.58%	
Total	36	82	6	5	129	100%	

*Pearson's Chi square test

Out of 129 eyes with maculopathy, concurrent hypertension was found in 43.42% of study population and there was no significant association of hypertension with maculopathy.

Table 18

Hypertension Vs Incidence of macular edema

Hypertension	Incidence of macular edema		Total	P value
	Yes	No		
Yes	0	24	24	0.079
No	6	36	42	
Total	6	60	66	

*Fisher's Exact test

Among non-hypertensives, 6 developed macular edema and it was not significant.

Table 19

Obesity Vs DR stage

Obesity	DR stage							Total	%
	Mild NPDR	Moderate NPDR	Severe NPDR	Very severe NPDR	Early PDR	High risk PDR	ADED		
Yes	6	4	4	0	5	5	2	26	13.40%
No	19	56	35	4	30	15	9	168	86.60%
Total	25	60	39	4	35	20	11	194	100%

*Kendall's tau test

Correlation coefficient 0.053, P value 0.4

Out of 194 eyes with DR, 26 had obesity which accounted for 13.40%. There was no significant correlation between obesity and progression of DR.

Table 20

Obesity Vs Maculopathy

Obesity	Maculopathy				Total	%	P value
	Focal	Diffuse	Ischaemic	Mixed			
Yes	5	13	0	2	20	15.50%	0.166
No	31	69	6	3	109	84.50%	
Total	36	82	6	5	129	100%	

*Pearson's Chi square test

Among 129 eyes with maculopathy, 20 had obesity which accounted for 15.50%. There was no significant association of obesity with maculopathy.

Table 21

Obesity Vs Incidence of macular edema

Obesity	Incidence of macular edema		Total	P value
	Yes	No		
Yes	0	6	6	1.000
No	6	54	60	
Total	6	60	66	

*Fisher's Exact test

Obese patients didn't develop macular edema in 6 months and it was not statistically significant.

Table 22

History of hypercholesterolemia Vs DR stage

History of hyper cholesterolemia	DR stage							Total	%
	Mild NPDR	Moderate NPDR	Severe NPDR	Very severe NPDR	Early PDR	High risk PDR	ADED		
Yes	0	4	0	0	0	0	0	4	2.06%
No	25	56	39	4	35	20	11	190	97.94%
Total	25	60	39	4	35	20	11	194	100%

*Kendall's tau test

Correlation coefficient -0.089. P value 0.156

Among 194 patients, history of hypercholesterolemia was found in 4 patients and accounted for 2.06%. There was no significant correlation between history of hypercholesterolemia and progression of DR.

Table 23

History of hypercholesterolemia Vs Maculopathy

History of hypercholesterolemia	Maculopathy				Total	%	P value
	Focal	Diffuse	Ischaemic	Mixed			
Yes	2	2	0	0	4	3.10%	0.3
No	34	80	6	5	125	96.90%	
Total	36	82	6	5	129	100%	

*Pearson's Chi square test

Among 129 patients with maculopathy, 4 patients had history of hypercholesterolemia which accounted for 3.10%. There was no significant association of hypercholesterolemia with maculopathy.

Table 24

History of hypercholesterolemia Vs Incidence of macular edema

History of hypercholesterolemia	Incidence of macular edema		Total	P value
	Yes	No		
Yes	0	0	0	N/A
No	6	60	66	
Total	6	60	66	

*Pearson's Chi square test

Among 66 eyes, none with history of hypercholesterolemia developed macular edema.

Table 25

Family history of Diabetes Vs DR stage

Family history of Diabetes	**DR stage**							**Total**	**%**
	Mild NPDR	**Moderate NPDR**	**Severe NPDR**	**Very severe NPDR**	**Early PDR**	**High risk PDR**	**ADED**		
Yes	3	9	10	0	5	0	1	28	14.43%
No	22	51	29	4	30	20	10	166	85.57%
Total	25	60	39	4	35	20	11	194	100%

*Kendall's tau test

Correlation coefficient -0.035, P value 0.581

Family history of diabetes was found in 14.43% of study population with DR. There was no significant correlation between family history of diabetes and DR stage.

Table 26

Family history of diabetes Vs Maculopathy

Family history of diabetes	Maculopathy				Total	%	P value
	Focal	Diffuse	Ischaemic	Mixed			
Yes	2	20	0	0	22	17.05%	0.1
No	34	62	6	5	107	82.95%	
Total	36	82	6	5	129	100%	

*Pearson's Chi square test

Family history of diabetes was found in 22 (17.05%) patients with maculopathy. Family history of diabetes had no significant association with maculopathy.

Table 27

Family history of diabetes Vs Incidence of macular edema

Family history of diabetes	Incidence of macular edema		Total	P value
	Yes	No		
Yes	2	4	6	0.088
No	4	56	60	
Total	6	60	66	

*Fisher exact test

Among 6 patients who newly developed macular edema, 2 had family history of diabetes. Family history of diabetes had no significant association with incidence of macular edema.

Table 28

Family history of obesity Vs DR stage

Family history of Obesity	DR stage							Total	%
	Mild NPDR	Moderate NPDR	Severe NPDR	Very severe NPDR	Early PDR	High risk PDR	ADED		
Yes	3	1	1	0	4	0	0	9	4.52%
No	22	59	38	4	31	20	11	190	95.48%
Total	25	60	39	4	35	20	11	194	100%

*Kendall's tau test

Correlation coefficient -0.027, P value 0.665

Family history of obesity was found in 9 patients which was 4.52% of study population. There was no correlation between family history of obesity and DR stage and p value was not significant.

Table 29

Family history of obesity Vs Maculopathy

Family history of Obesity	Maculopathy				Total	%	P value
	Focal	Diffuse	Ischaemic	Mixed			
Yes	2	6	0	0	9	6.98%	0.122
No	34	76	6	5	120	93.02%	
Total	36	82	6	5	129	100%	

*Pearson's Chi square test

Family history of obesity was seen in 9 patients which was 6.98% of study population and there was no significant association of family history of obesity with maculopathy.

Table 30

Family history of Obesity Vs Incidence of macular edema

Family history of obesity	Incidence of macular edema		Total	P value
	Yes	No		
Yes	0	1	1	1.000
No	6	59	65	
Total	6	60	66	

*Fisher's Exact test

Family history of obesity had no significant association with development of macular edema.

Table 31

Family history of Hypertension Vs DR stage

Family history of hypertension	DR stage							Total	%
	Mild NPDR	Moderate NPDR	Severe NPDR	Very severe NPDR	Early PDR	High risk PDR	ADED		
Yes	3	2	8	0	1	0	0	14	7.22%
No	22	58	31	4	34	20	11	180	92.78%
Total	25	60	39	4	35	20	11	194	100%

*Kendall's tau test

Correlation coefficient -0.06, P value 0.34.

Family history of hypertension was seen in 14 patients which comprised 7.22% of study population. There was no significant correlation between family history of hypertension and progression of DR.

Table 32

Family history of hypertension Vs Maculopathy

Family history of hypertension	Maculopathy				Total	%	P value
	Focal	Diffuse	Ischaemic	Mixed			
Yes	0	10	0	0	10	7.75%	0.132
No	36	72	6	5	119	92.25%	
Total	36	82	6	5	129	100%	

*Pearson's Chi square test

7.75% of maculopathy eyes had family history of hypertension. Family history of hypertension had no significant association with maculopathy.

Table 33

Family history of hypertension Vs Incidence of macular edema

Family history of hypertension	Incidence of macular edema		Total	P value
	Yes	No		
Yes	2	2	4	0.039
No	4	58	62	
Total	6	60	66	

*Pearson's Chi square test

Family history of hypertension had significant association with development of macular edema.

Table 34

Family history of DR Vs DR stage

Family history of DR	DR stage							Total	%
	Mild NPDR	Moderate NPDR	Severe NPDR	Very severe NPDR	Early PDR	High risk PDR	ADED		
Yes	0	1	0	0	1	0	0	2	1.03%
No	25	59	39	4	34	20	11	192	98.97%
Total	25	60	39	4	35	20	11	194	100%

*Kendall's tau test

Correlation coefficient 0.009, P value 0.885

1.03% had family history of DR. Family history of DR and DR Stage had no significant correlation.

Table 35

Family history of DR Vs maculopathy

Family history of DR	Maculopathy				Total	%	P value
	Focal	Diffuse	Ischaemic	Mixed			
Yes	2	0	0	0	2	1.55%	0.05
No	34	82	6	5	127	98.45%	
Total	36	82	6	5	129	100%	

2 eyes with focal maculopathy had family history of diabetic retinopathy. Family history of DR had significant association with maculopathy.

Table 36

Family history of DR Vs Incidence of macular edema

Family history of DR	Incidence of macular edema		Total	P value
	Yes	No		
Yes	0	2	2	1.000
No	6	58	64	
Total	6	60	66	

*Fisher's Exact test

Family history of DR had no significant association with development of macular edema.

Table 37

Smoking Vs DR stage

Smoking	DR stage							Total	%
	Mild NPDR	Moderate NPDR	Severe NPDR	Very severe NPDR	Early PDR	High risk PDR	ADED		
Yes	3	14	8	0	1	1	4	31	15.98%
No	22	46	31	4	34	19	7	163	84.02%
Total	25	60	39	4	35	20	11	194	100%

*Kendall's tau test

Correlation coefficient -0.067, P value 0.287.

Out of 194 eyes with DR, 31 were smokers which was 15.98%. There was no correlation between smoking and DR stage and p value was not significant.

Table 38

Smoking Vs Maculopathy

Smoking	Maculopathy				Total	%	P value
	Focal	Diffuse	Ischaemic	Mixed			
Yes	8	14	5	1	28	21.71%	0.003
No	28	68	1	4	101	78.29%	
Total	36	82	6	5	129	100%	

*Pearson's Chi square test

28 eyes(21.71%) among 129 eyes with maculopathy had history of smoking . Smoking and maculopathy had significant association.

Table 39

Smoking Vs Incidence of macular edema

Smoking	Incidence of macular edema		Total	Percentage	P value
	Yes	No			
Yes	0	4	4	6.06%	1.000
No	6	56	62	93.94%	
Total	6	60	66	100%	

*Fisher's Exact test

There was no significant association of smoking with incidence of macular edema.

Table 40

Smoking Vs Worsening of vision

Smoking	Worsening of vision		Total	P value
	Yes	No		
Yes	25	3	28	0.102
No	125	41	166	
Total	6	60	194	

*Pearson's Chi square test

Smoking and worsening of vision had no significant association.

Table 41

Alcohol Vs DR stage

Alcohol	DR stage							Total	%
	Mild NPDR	Moderate NPDR	Severe NPDR	Very severe NPDR	Early PDR	High risk PDR	ADED		
Yes	0	14	4	0	1	1	1	21	10.82%
No	25	46	35	4	34	19	10	173	89.18%
Total	25	60	39	4	35	20	11	194	100%

*Pearson's Chi square test

21 out of 194 eyes had history of alcoholism which accounted for 10.82%. Alcohol and DR stage had no significant correlation.

Table 42

Alcohol Vs Maculopathy

Alcohol	Maculopathy				Total	%	P value
	Focal	Diffuse	Ischaemic	Mixed			
Yes	6	9	5	1	21	16.27%	<0.0001
No	30	73	1	4	108	83.72%	
Total	36	82	6	5	129	100%	

*Pearson's Chi square test

21 out of 129 eyes with maculopathy had history of alcoholism which accounted for 16.27%. Alcohol and maculopathy had significant correlation.

Table 43

Alcohol Vs Incidence of macular edema

Alcohol	Incidence of macular edema		Total	P value
	Yes	No		
Yes	0	0	0	N/A
No	6	60	66	
Total	6	60	66	

None of the alcoholics developed macular edema.

Table 44

Alcohol Vs Worsening of vision

Smoking	Worsening of vision		Total	P value
	Yes	No		
Yes	3	16	19	0.573
No	41	134	175	
Total	44	150	194	

*Pearson’s Chi square test

Alcohol and worsening of vision had no significant association.

Table 45

Awareness Vs DR stage

Awareness	DR stage								Total	Percentage
	No DR	Mild NPDR	Moderate NPDR	Severe NPDR	Very severe NPDR	Early PDR	High risk PDR	ADED		
None	0	2	10	2	0	2	2	2	20	10.05%
Diabetes can affect eye sight	4	6	30	15	3	15	7	3	83	41.71%
Diabetes can cause permanent blindness	1	14	10	7	1	12	6	5	56	28.14%
Retinopathy related to nephropathy	0	3	10	15	0	6	5	1	40	20.10%
Total	5	25	60	39	4	35	20	11	199	100%

*Kendall's tau test

Correlation coefficient 0.054, P value 0.358.

In this study, 41.71% of diabetics were aware that diabetes can affect eye sight, 28.14% were aware that diabetes can cause permanent blindness, 20.10% had awareness on retinopathy related to nephropathy and 10.05% had no awareness. Awareness and DR stage had no significant correlation.

Table 46

Treatment history Vs DR stage

Treatment history	DR stage							Total	%	P value
	Mild NPDR	Moderate NPDR	Severe NPDR	Very severe NPDR	Early PDR	High risk PDR	ADED			
Insulin	6	18	8	2	7	1	0	42	21.11%	
OHA	19	41	26	2	27	16	11	147	73.87%	
Both	0	1	5	0	1	3	0	10	5.02%	0.032
Total	25	60	39	4	35	20	11	194	100%	

*Pearson's Chi-Square test

Among the DR patients, 21.11% were under treatment with insulin, 73.87% on treatment with OHA and 5.02% were under treatment with both insulin and oral hypoglycaemic agents. Our study group per se had more number of patients on OHA. Type of treatment taken for diabetes and DR stage had significant association.

Table 47

Treatment history Vs Maculopathy

Treatment history	Maculopathy				Total	%	P value
	Focal	Diffuse	Ischaemic	Mixed			
Insulin	7	28	2	0	37	28.68%	<0.0001
OHA	29	50	4	5	88	68.22%	
Both	0	4	0	0	4	3.10%	
Total	36	82	6	5	129	100%	

*Pearson's Chi square test

29 out of 36 (89.56%) patients with focal maculopathy was on OHA, and 7 out of 36 patients (19.44%) were on insulin. 28 out of 82 (34.14%) patients with diffuse maculopathy were on insulin, 50 out of 82 (60.98%) were on OHA and 4 out of 82 (4.88%) were on treatment with both insulin and OHA. Among 6 ischaemic maculopathy patients, 2 (33.33%) were on insulin and 4 (66.67%) were on OHA. All 5 patients with mixed maculopathy were on treatment with OHA. There was significant association of type of treatment taken for diabetes with type of maculopathy.

Table 48

Treatment history Vs Incidence of macular edema

Treatment history	Incidence of macular edema		Total	Percentage	P value
	Yes	No			
Insulin	1	4	5	7.58%	0.507
OHA	4	51	55	83.33%	
Both	1	5	6	9.09%	
Total	6	60	66	100%	

*Pearson's Chi square test

Treatment history and development of macular edema had no significant association.

Table 49

Treatment history Vs Worsening of vision

Treatment history	Worsening of vision		Total	Percentage	P value
	Yes	No			
Insulin	13	29	42	21.65%	0.351
OHA	29	113	142	73.20%	
Both	2	8	10	5.15%	
Total	44	150	194	100%	

*Pearson's Chi square test

Treatment history and development of macular edema had no significant association.

Table 50

Treatment non-adherence Vs DR stage

Treatment non-adherence	DR stage							Total	%
	Mild NPDR	Moderate NPDR	Severe NPDR	Very severe NPDR	Early PDR	High risk PDR	ADED		
Yes	0	2	6	0	4	7	1	15	7.73%
No	25	58	33	4	31	13	10	179	92.27%
Total	25	60	39	4	35	20	11	194	100%

*Kendall's tau test

Correlation coefficient 0.219, P value 0.001.

7.73% of patients who were not adherent to treatment for diabetes had DR.

Treatment non-adherence had significant correlation with progression of DR.

Table 51

Treatment non- adherence vs maculopathy

Treatment non-adherence	Maculopathy				Total	%	P value
	Focal	Diffuse	Ischaemic	Mixed			
Yes	0	9	0	0	9	6.98%	0.136
No	36	73	6	5	120	93.02%	
Total	36	82	6	5	129	100%	

*Pearson's Chi square test

6.98% of treatment nonadherence patients had maculopathy. There was no significant association of treatment nonadherence with type of maculopathy.

Table 52

Treatment non-adherence Vs Incidence of macular edema

Treatment non-adherence	Development of macular edema		Total	P value
	Yes	No		
Yes	1	10	11	1.000
No	5	50	55	
Total	6	60	66	

*Fisher's Exact test

Treatment non-adherence had no significant association with development of macular edema.

Table 53

Glaucoma Vs DR stage

Glaucoma	DR stage							Total	%
	Mild NPDR	Moderate NPDR	Severe NPDR	Very severe NPDR	Early PDR	High risk PDR	ADED		
Yes	5	4	0	1	0	0	1	11	5.53%
No	20	56	39	3	35	20	10	83	94.47%
Total	25	60	39	4	35	20	11	194	100%

*Kendall's tau test

Correlation coefficient 0.154, P value 0.015.

11 out of 199 (5.53%) had glaucoma among DR patients. 2 eyes had secondary open angle glaucoma, 2 had primary open angle glaucoma, 3 had neovascular glaucoma and 4 had primary angle closure glaucoma. Glaucoma and DR stage had significant correlation.

Table 54

Glaucoma Vs Maculopathy

Glaucoma	Maculopathy				Total	%	P value
	Focal	Diffuse	Ischaemic	Mixed			
Yes	4	1	0	0	5	3.88%	0.199
No	32	81	6	5	124	96.12%	
Total	36	82	6	5	129	100%	

*Pearson's Chi square test

5 out of 129 patients i.e; 3.88 % had glaucoma among maculopathy population. Glaucoma and maculopathy had no significant correlation.

Table 55

Glaucoma Vs Incidence of macular edema

Glaucoma	Incidence of macular edema		Total	P value
	Yes	No		
Yes	6	0	6	<0.0001
No	0	60	60	
Total	6	60	66	

*Fisher's Exact test

6 patients with glaucoma developed macular edema and there was significant association of glaucoma with incidence of macular edema.

Table 56

Microalbuminuria Vs DR stage

Micro albuminuria	DR stage							Total	%
	Mild NPDR	Moderate NPDR	Severe NPDR	Very severe NPDR	Early PDR	High risk PDR	ADED		
Yes	0	4	5	0	3	3	3	18	9.28%
No	25	56	34	4	32	17	8	176	90.72%
Total	25	60	39	4	35	20	11	194	100%

*Kendall's tau test

Correlation coefficient 0.156, P value 0.014.

18 eyes (9.28%) had microalbuminuria among 194 eyes with DR.

Microalbuminuria and DR stage had significant correlation.

Table 57

Microalbuminuria Vs Maculopathy

Micro albuminuria	Maculopathy				Total	%	P value
	Focal	Diffuse	Ischaemic	Mixed			
Yes	3	7	0	2	12	9.30%	0.864
No	33	75	6	3	117	90.70%	
Total	36	82	6	5	129	100%	

12 eyes (9.30%) among 129 eyes with maculopathy had microalbuminuria.

There was no significant association of microalbuminuria with maculopathy.

Table 58

Hypertensive retinopathy Vs DR stage

Hypertensive retinopathy	DR stage							Total	%	Correlation coefficient
	Mild NPDR	Moderate NPDR	Severe NPDR	Very severe NPDR	Early PDR	High risk PDR	ADED			
Nil	3	21	7	0	2	0	0	33	43.42%	-0.009
Grade 1	2	13	5	0	2	1	0	23	30.26%	P
Grade 2	4	12	3	0	4	4	3	20	26.32%	value
Total	25	60	39	4	35	20	11	194	100%	0.885

*Pearson's Chi square test

Among 76 DR patients with hypertension, 33 (43.42%) had no hypertensive retinopathy, 23 (30.26%) had grade 1 hypertensive retinopathy and 20 (26.32%) had grade 2 hypertensive retinopathy. Hypertensive retinopathy grading and DR stage had no significant correlation.

Table 59

Hypertensive retinopathy Vs Maculopathy

Hypertensive retinopathy	Maculopathy				Total	%	P value
	Focal	Diffuse	Ischaemic	Mixed			
Nil	11	15	0	0	26	46.43%	
Grade 1	5	10	0	2	17	30.36%	0.134
Grade 2	2	10	1	0	13	23.21%	
Total	36	82	6	5	129	100%	

*Pearson's Chi square test

Among 56 patients with maculopathy and hypertension, 26 (46.43 %) had no hypertensive retinopathy, 17 (30.36 %) had grade 1 hypertensive retinopathy and 13 (23.21 %) had grade 2 hypertensive retinopathy. In this study none of the cases had grade 3 or grade 4 hypertensive retinopathy. Hypertensive retinopathy grading and type of maculopathy had no significant association.

Table 60

AV ratio Vs Maculopathy

AV ratio	Maculopathy				Total	%	P value
	Focal	Diffuse	Ischaemic	Mixed			
2:3	27	47	3	0	77	59.69%	0.010
1:3	0	4	0	3	7	5.43%	
1:4	5	3	0	1	9	6.97%	
2:4	4	28	3	1	36	27.91%	
Total	36	82	6	5	129	100%	

*Pearson's Chi square test

Normal A:V ratio (2:3) was found in 59.69 %, arteriolar narrowing with normal venous calibre was found in 5.43%, both arteriolar narrowing and venous dilatation was found in 6.97% and only venous dilatation found in 27.91%.

27/36 eyes (75%) with focal maculopathy had normal A:V ratio, 5/36 eyes(13.89%) had 1:4 ratio, 4/36 (11.11%) had 2:4 ratio. 47/82 eyes (57.31%) with diffuse maculopathy had normal A:V ratio, 4/82 eyes (4.88%) had 1:3 ratio, 3/82 eyes(3.66%) had 1:4 ratio, 28/82 (34.14%) had 2:4 ratio. 3/6 eyes (50%) with ischaemic maculopathy had normal A:V ratio and 3/6 (50%) had 2:4 ratio. 3/5 eyes (60%) had A:V ratio of 1:3, 1/5 eyes each 20% for both 1:4 ratio and 2:4

ratio. Venous dilatation was associated with maculopathy. There was significant association of A:V ratio with maculopathy.

Table 61

Various confounders in the study

Parameters	Mean	S.D	DR stage		Maculopathy		Development of M.E.		Worsening of vision	
			C.C	P value	C.C	P value	C.C	P value	C.C	P value
IOP	14.70	4.17	0.027	0.618	0.076	0.218	0.057	0.362	0.026	0.671
Systolic BP	129.78	15.85	-0.144	**0.007**	0.010	0.871	-0.080	0.183	-0.005	0.932
Diastolic BP	81.08	8.55	-0.086	0.106	0.078	0.198	-0.066	0.278	-0.063	0.305
FBS	153.94	65.77	-0.025	0.632	-0.031	0.592	-0.007	0.906	-0.081	0.170
PPBS	256.97	77.08	0.059	0.254	-0.065	0.270	-0.071	0.228	-0.042	0.474
Urea	28.14	10.48	.006	0.910	0.015	0.804	0.016	0.790	-0.204	**0.001**
Creatinine	1.185	0.59	-0.010	0.855	-0.088	0.137	0.045	0.444	-0.095	0.112
Total cholesterol	184.75	35.76	-0.058	0.268	0.128	**0.037**	-0.047	0.445	0.039	0.528
Triglycerides	127.23	53.17	-0.135	**0.010**	0.187	**0.001**	0.068	0.249	0.023	0.700
HDL	41.78	8.26	0.155	**0.004**	-0.124	**0.038**	-0.009	0.877	-0.047	0.438
LDL	98.69	22.79	-0.085	0.106	0.117	**0.049**	0.018	0.769	-0.062	0.301
VLDL	49.45	19.58	-0.154	**0.003**	-0.006	0.913	0.012	0.837	-0.171	**0.004**
TC/HDL ratio	4.63	1.48	-0.127	**0.015**	0.023	0.699	0.033	0.572	0.005	0.929
LDL/HDL ratio	2.46	0.78	-0.126	**0.016**	0.167	**0.004**	0.003	0.965	0.041	0.491
Hb	11.81	1.77	0.001	0.988	0.008	0.897	-0.048	0.423	0.053	0.380
HbA1C	8.76	1.83	0.161	0.092	0.024	0.820	0.074	0.491	-0.109	0.317

*Kendall's tau test

Total cholesterol, triglycerides, LDL, LDL/ HDL ratio had positive correlation with maculopathy.

Table 62

Maculopathy Vs Treatment

Maculopathy	Treatment								Total	P value
	Focal laser	Grid laser	PRP	Anti-VEGF	IVTA	NSAID eye drops	PPV	Combined treatment		
Focal	21	0	5	3	1	5	0	1	36	<0.0001
Diffuse	2	45	14	5	0	0	2	14	82	
Ischaemic	0	0	0	2	0	0	1	3	6	
Mixed	0	0	3	2	0	0	0	0	5	
Total	23	45	22	12	1	5	3	18	129	

*Pearson's Chi square test

Among 129 eyes which underwent treatment, 23 were treated with focal laser, 45 with grid laser, 22 with panretinal photocoagulation, 12 with anti-VEGF, 1 with intravitreal Triamcinolone, 5 with NSAID eye drops and 3 with vitrectomy. 18 eyes (13.95%) required combination of 2 or more therapies. 68 eyes (52.71%) underwent focal and grid laser. There was significant association of type of maculopathy with treatment.

Table 63

Treatment Vs Visual outcome in DR

Treatment	Visual outcome			Total	P value
	Worsened	Stationary	Improved		
Focal laser	8	7	10	25	<0.0001
Grid laser	10	13	22	45	
PRP	11	7	23	41	
Anti-VEGF	2	6	4	12	
IVTA	0	0	1	1	
NSAID eye drops	1	6	4	11	
Vitrectomy	0	1	2	3	
Combined treatment	7	4	13	24	
Total	39	44	79	162	

*Pearson's Chi square test

Among 162 eyes with DR, 39 eyes had worsening of vision , 44 remained stationary and 79 eyes improved. Maximum number of eyes required laser therapy and visual outcome was better in that group. There was significant association of type of treatment with visual outcome in DR.

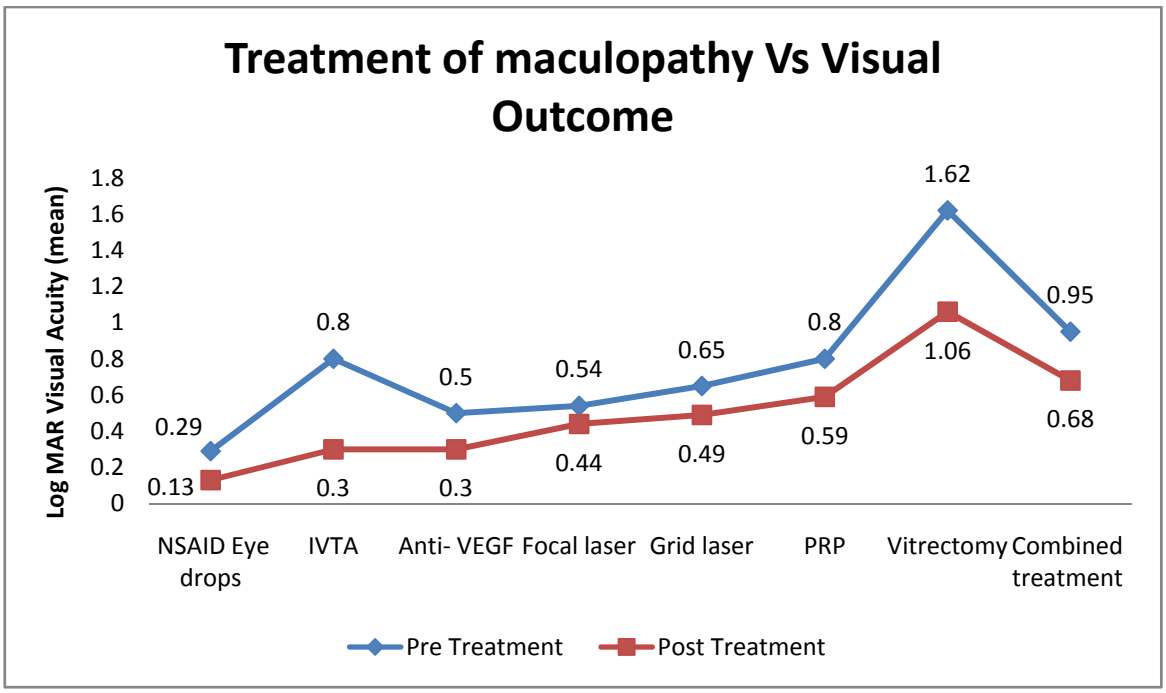


Table 64

Type of maculopathy Vs Visual outcome

Type of maculopathy	Worsened vision		Stationary vision		Improvement of vision		Total	P value
	Number	%	Number	%	Number	%		
Focal maculopathy	13	36.11%	11	30.56%	12	33.33%	36	0.044
Diffuse maculopathy	18	21.95%	25	30.49%	39	47.56%	82	
Ischaemic maculopathy	2	33.33%	1	16.67%	3	50%	6	
Mixed maculopathy	0	0%	2	40%	3	60%	5	
Total	33	25.58%	39	30.23%	56	43.41%	129	

*Pearson's Chi square test

After treatment, among focal maculopathy patients, 33.33% had improvement of vision, 30.56% had stationary vision and 36.11% had worsened vision. In diffuse maculopathy patients, 47.56% had improvement of vision, 30.49% had stationary vision and 21.95% had worsened vision. 50% ischaemic maculopathy patients had improvement of vision 16.67% had stationary vision and 33.33% had worsening of vision. 50% of ischaemic maculopathy had improvement of vision because these eyes already had poor visual acuity at presentation. Among mixed maculopathy, 60% had improvement of vision and 40% had stationary vision. There was significant association of visual outcome with type of maculopathy.

Table 65

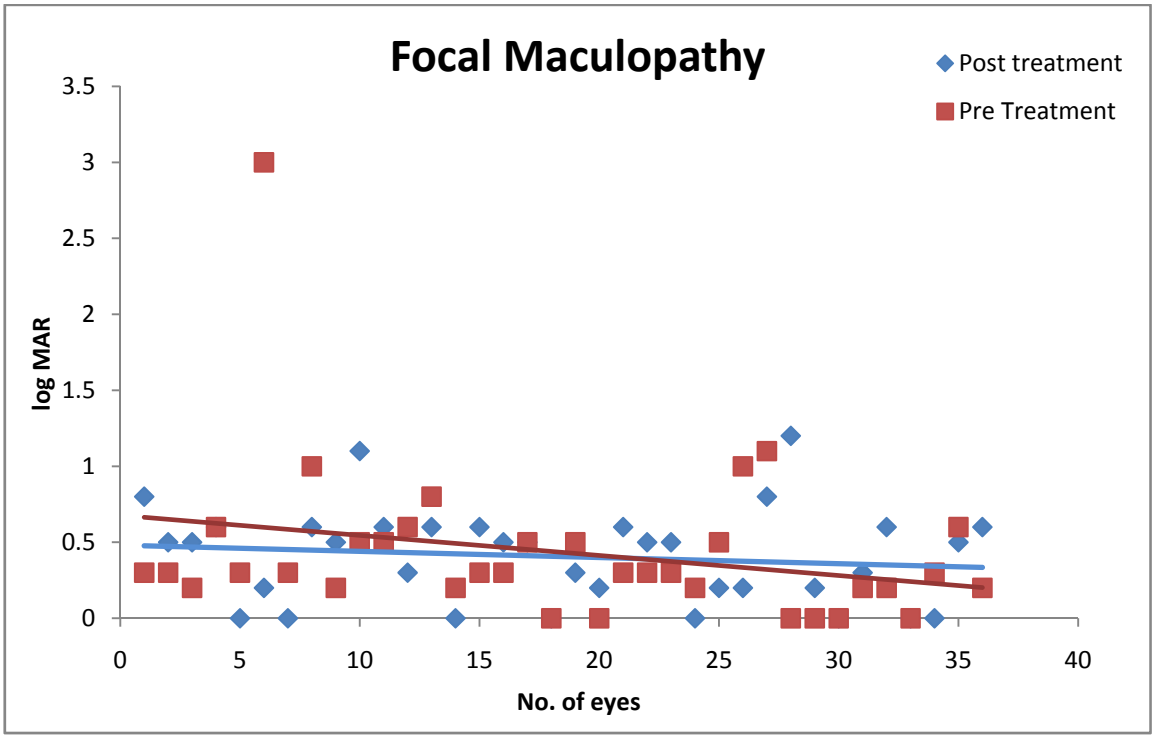
Laser in maculopathy Vs Visual outcome

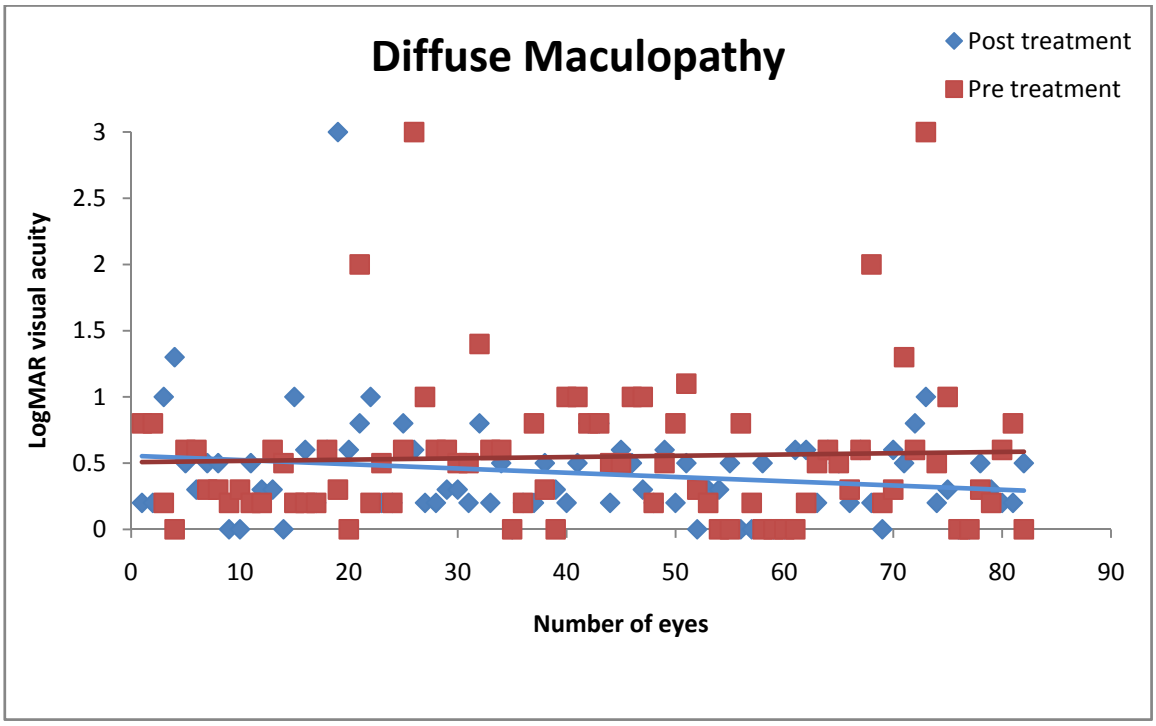
	Improved	**Not improved**	**Total**	**P Value**
Laser	29	39	68	<0.0001
Non-laser	27	4	31	
Total	56	43	99	

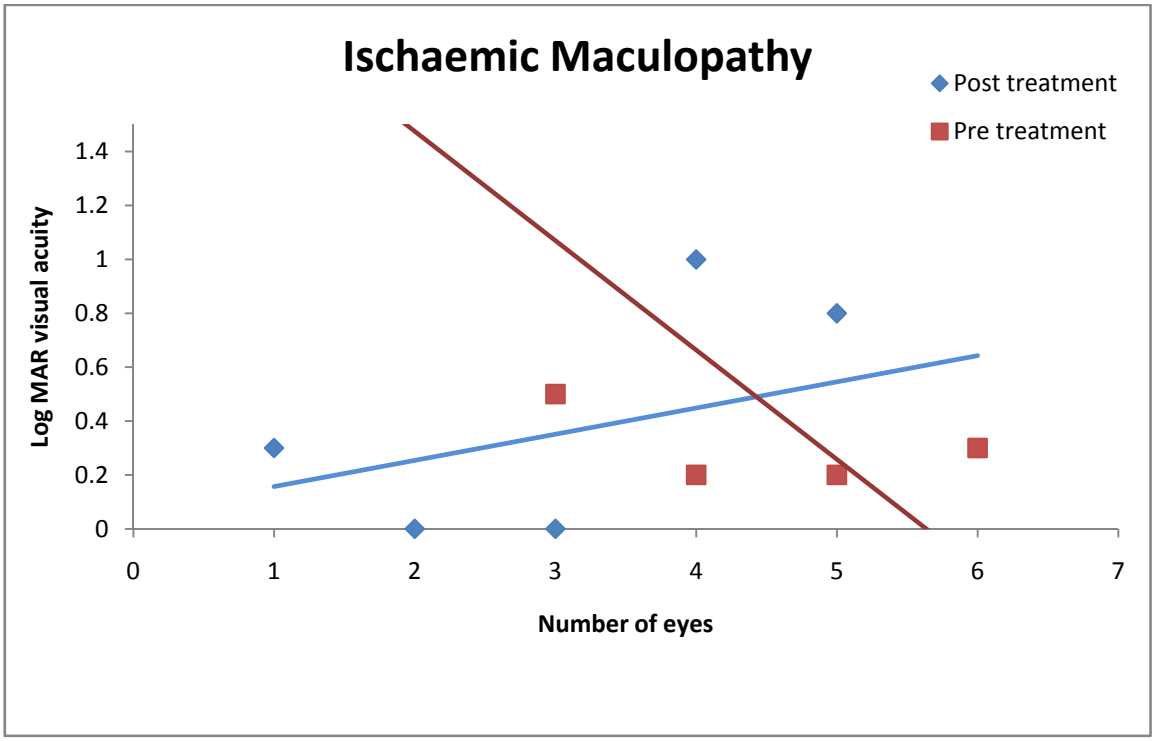
*Fisher's Exact test

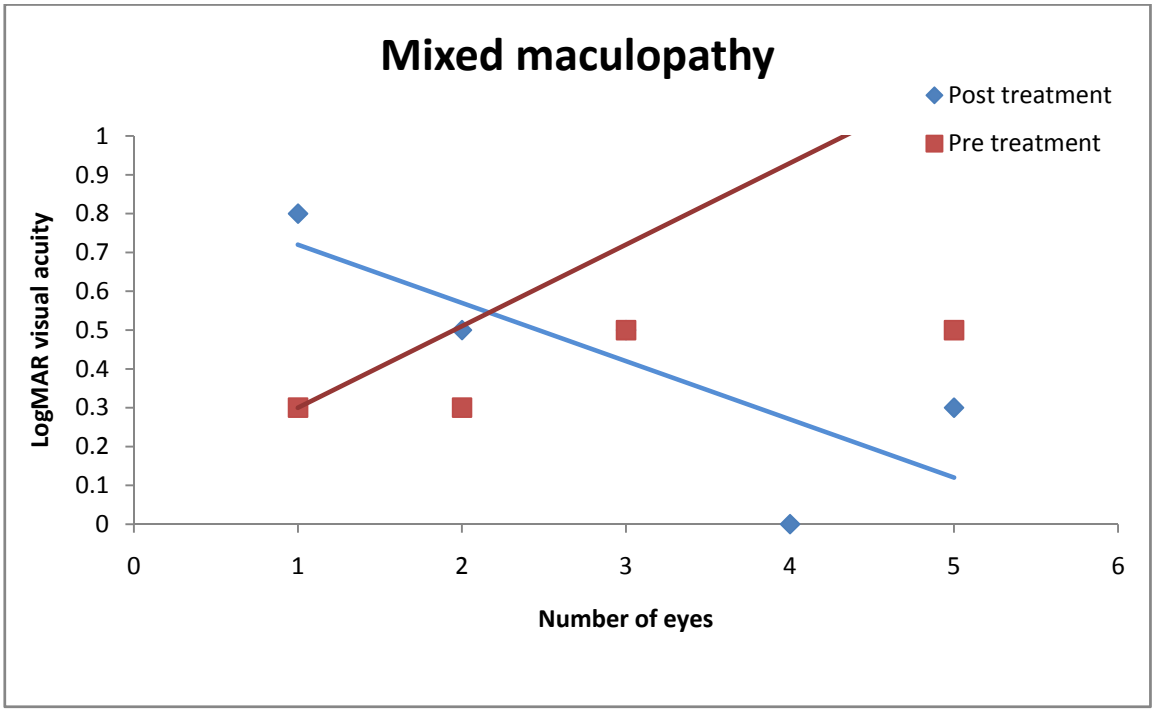
Laser- treated eyes (29) had maximum improvement among the total eyes which had improved vision(56). There was significant association of improvement of vision with laser therapy.

Comparison of visual acuity (log MAR) pre treatment and post treatment






Ischaemic Maculopathy
Post treatment
Pre treatment
Log MAR visual acuity
1.4
1.2
1
0.8
0.6
0.4
0.2
0
0
1
2
3
4
5
6
7
Number of eyes


Mixed maculopathy
Post treatment
Pre treatment
LogMAR visual acuity
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
1
2
3
4
5
6
Number of eyes

14. DISCUSSION

In this study maximum number of diabetics belong to 6th decade i.e; 51-60 years age group which was comparable to Joslin et al[1] study. Male to female ratio was 2.1 : 1 whereas Golubovic Arsovska[37] reported male to female ratio of 1.26 :1.

Out of the 100 patients, only 2 patients were referred from other speciality OPD and 98 patients directly attended eye OPD either with complaints of diminution of distant or near vision or attended OPD for routine eye check up.

58.76% of diabetic retinopathy cases had diabetes for less than 10 years which was slightly higher than Mahfouth et al study[48] (52%). Among patients with maculopathy, 49.61% had diabetes for less than 10 years but Klein R [49] reported 20.1% .

Diffuse maculopathy (63.57%) was the most common type of maculopathy followed by focal (27.91%), ischaemic (4.65%) and mixed (3.87%) maculopathy while in Golubovic et al study[37] mixed maculopathy (77.56%) was the most common type of maculopathy followed by exudative(39%), ischaemic (4%) and edematous (1%) maculopathy.

Diffuse maculopathy was the commonest irrespective of DR stage. DR stage and prevalence of maculopathy had statistically significant correlation (P value 0.002). Moderate NPDR and severe NPDR showed maximum proportion of patients with maculopathy . DR stage and type of maculopathy had statistically significant association (P value < 0.0001). Moderate NPDR and severe NPDR

showed maximum proportion of patients with macular edema. DR stage and incidence of macular edema had no significant correlation (P value 0.513).

Among 70 eyes without maculopathy at presentation, 4 lost to follow up and 66 were followed up for 6 months. 6 out of 66 eyes (9.09%) developed macular edema during 6 month follow up. Out of the 6 diabetics who developed macular edema, 1(3.7%) had diabetes for 1-5 years, 1 (4.16%) had diabetes for 6-10 years, 4 (57.14%) had diabetes for 11-15 years and p value was significant. Longer duration of diabetes hastened the development of macular edema (P value 0.0001).

39.17% of hypertensives had DR at presentation which was comparable with Klein et al study[6]. Hypertension had no correlation with progression of DR and p value was significant (0.001). This was comparable to DCCT study[50]. 43.41% of hypertensives had maculopathy at presentation and there was no significant association of hypertension with maculopathy (P value 0.21). Hypertension and incidence of macular edema had no significant association (P value 1.000).

Obesity had no significant correlation with DR (P value 0.4) and no association with maculopathy (P value 0.166) or development of macular edema (P value 1.000).

History of hypercholesterolemia had no significant correlation with progression of DR (P value 0.156) and had no association with maculopathy (P value 0.3) or incidence of macular edema (P value 1.000). This was contradictory to Ferris et al study[7].

Family history of diabetes, hypertension, DR and obesity had no correlation with DR and no association with maculopathy and P value was not significant. Family history of DR had significant association with maculopathy. Family history of Hypertension had significant association with development of macular edema (P value 0.039). Family history of diabetes, obesity and DR had no association with incidence of macular edema (P value 1.000).

Smoking had no significant correlation with DR (P value 0.287) . It was comparable to Muhlhauser et al study[36]. There was significant (P value 0.003) association of smoking with maculopathy. There was no significant association of smoking with incidence of macular edema (P value 1.000)

Alcohol and DR had no significant correlation (P value 0.236) but alcohol and maculopathy had significant association (P value <0.0001)

Patient awareness about DR and progression of DR had no significant correlation (P value 0.358).

Regarding treatment taken for diabetes, majority of the population (73.87%) were on oral hypoglycaemic agents, 21.11% of study population were on treatment with insulin, 5.02% were on treatment with both insulin and oral hypoglycaemic drugs. The magnitude of DR was surprisingly high in patients who were on oral hypoglycaemic drugs alone with significant association (P value 0.032). The proportion of patients with maculopathy was significantly higher with oral hypoglycaemic drugs(68.32%) (P value <0.0001). This is because the study group per se had more patients on OHA group. 40% of diabetics under treatment with insulin developed macular edema, 5.08% who was under treatment

with oral hypoglycaemic agents developed macular edema and 16% of diabetics on both insulin and oral hypoglycaemic agents developed macular edema. Patients on insulin were found to have developed macular edema higher than patients on OHA alone and both insulin and OHA group (P value 0.021) which was comparable to WESDR study[51]. Type of treatment taken for Diabetes had no association with development of macular edema (P value 0.507) or with worsening of vision (P value 0.351).

7.73% of patients who were not adherent to treatment for diabetes had DR. Treatment non-adherence had significant correlation with progression of DR (P value 0.001). 6.98% of treatment nonadherence patients had maculopathy. There was no significant association of treatment nonadherence with type of maculopathy (P value 0.136). 9.09% of diabetics on regular treatment developed macular edema and 9.09% diabetics who were nonadherent to treatment developed macular edema. Treatment nonadherence didn't influence the incidence of macular edema and there was no significant association (P value 1.000).

Glaucoma was found in 5.67% of total DR patients in contrast to Malfouth A Bamashmus study[48] who reported 8.6% of patients with diabetes. 1.51% had neovascular glaucoma among study population. Glaucoma and progression of DR had significant correlation (P value 0.015%) but Glaucoma and maculopathy had no significant association (P value 0.199). 6 patients with glaucoma developed macular edema and there was significant association (P value <0.0001).

In our study, none of the patients with DR who underwent cataract surgery developed macular edema and P value was not significant (1.000).

Microalbuminuria was seen in 9.28% of study population which was low as compared to Feldman et al. study who reported 35% . Microalbuminuria had significant correlation with progression of DR (P value 0.014). 9.30% of study population had maculopathy at presentation and there was no significant association of microalbuminuria with maculopathy (P value 0.864).

56.58% hypertensives had hypertensive retinopathy in patients with DR and hypertension. None of my study population had grade 3 or grade 4 hypertensive retinopathy. Hypertensive retinopathy grading had no correlation with progression of DR (P value 0.885) and no association with maculopathy (P value 0.134).

Normal A:V ratio (2:3) was found in 59.69% of patients, arteriolar narrowing with normal venous calibre was found in 5.43%, both arteriolar narrowing and venous dilatation was found in 6.97% and only venous dilatation found in 27.91%. Venous dilatation was found to be more common with maculopathy and the P value was significant (0.010).

Total cholesterol, triglycerides, LDL, LDL/ HDL ratio had positive correlation with maculopathy which was comparable to Ferris FL study[7].

13.95% of eyes required combined treatment with 2 or more therapies . 68 eyes(52.71%) underwent focal and grid laser. There was significant association of type of maculopathy with treatment (<0.0001).

After treatment, among focal maculopathy patients, 33.33% had improvement of vision, 30.56% had stationary vision and 36.11% had worsened vision. In diffuse maculopathy patients, 47.56% had improvement of vision, 30.49% had stationary vision and 21.95% had worsened vision. 50% ischaemic maculopathy patients had improvement of vision 16.67% had stationary vision and 33.33% had worsening of vision. 50% of ischaemic maculopathy had improvement of vision because these patients already had poor visual acuity at presentation. Among mixed maculopathy, 60% had improvement of vision and 40% had stationary vision. There was significant association of visual outcome with type of maculopathy. Laser- treated eyes (29) had maximum improvement among the total eyes which had improvement of vision (56). There was significant association of improvement of vision with laser therapy.

LIMITATIONS OF THIS STUDY:

1. Smaller sample size
2. The follow up period was only 6 months which was not enough in diabetes microangiopathy.

15. SUMMARY

Diabetic retinopathy and maculopathy were common in the sixth decade of life of which moderate NPDR and diffuse maculopathy were the commonest.

Patients directly attending department of Ophthalmology was much more than referral. Diffuse maculopathy was the commonest irrespective of DR stage. Moderate NPDR and severe NPDR showed maximum proportion of patients with macular edema. Patients in stage of moderate NPDR and severe NPDR progressed to macular edema within 6 months at 66% and 33% respectively. So observation has to be more stringent in these conditions. In our population, sub-cohort of increased duration of Diabetes are low which may be explained by disability and mortality with increase in age.

Duration of diabetes, treatment non-adherence for diabetes, glaucoma, microalbuminuria and total cholesterol/ HDL ratio are the positive risk factors for the progression of DR. Smoking, alcohol, total cholesterol, triglyceride levels, low HDL level and an abnormal A : V ratio are risk factors for maculopathy. The incidence of macular edema was observed in moderate and severe NPDR. High PPBS, glaucoma and uncontrolled diastolic BP are the definite risk factors for incidence of macular edema in patients with Diabetic retinopathy. No risk factors could be explained for worsening of vision during the study period. Treatment adherence is an important factor in controlling progression of DR. Patients with glaucoma had incidence of macular edema in short period which was never reported in literature and needs further study. Nephropathy positively correlated

with DR. Retinal venous dilatation is an important indicator towards maculopathy. Laser is the most effective treatment for diffuse maculopathy.

16. CONCLUSION

The study demonstrated significant increase in diabetic maculopathy in the sixth decade. Diffuse maculopathy was the commonest irrespective of the stage of diabetic retinopathy.

The study suggested a potential role of risk factors like duration of diabetes, treatment non-adherence for diabetes, glaucoma, microalbuminuria and total cholesterol/ HDL ratio for Diabetic retinopathy. Risk factors like family history of diabetic retinopathy, smoking, alcohol, total cholesterol, triglyceride levels, low HDL level and an abnormal A : V ratio favour maculopathy. This highlights the need for more social awareness and screening of diabetic patients and needs frequent follow- up with these risk factors.

Patients with diffuse maculopathy responded well to laser therapy.

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CASE REPORT FORM

STUDY OF CORRELATION OF DIABETIC MACULOPATHY AND THE STAGE OF DIABETIC RETINOPATHY

Name: **Age:** **Sex:**

OP No: **Occupation**:

Address: **Phone No:**

Referred from diabetology OP/directly attending eye OP

Diagnosis:

Type I/Type II

Complaints:

i)Defective vision for – distant vision

near vision

duration

metamorphopsia

frequent glass change

ii)Field of vision- Central scotoma

Past History:

i)Diabetes - Duration

Previously diagnosed diabetic retinopathy/diabetic maculopathy

ii) Hypertension

iii) Hypercholesterolemia

iv) Anaemia

v) Obesity

vi) Pedal edema

Family History:

a) Obesity

b) Diabetes

c) Hypertension

d) Diabetic retinopathy

Personal History:

i)Smoking

ii) Alcohol consumption

Socioeconomic status:

Treatment History:

Treatment on insulin/oral hypoglycaemic agents

Any awareness regarding

a)Diabetes can affect eye sight

b) Diabetes can cause permanent blindness

c)Retinopathy related to nephropathy

Examination:

Uncorrected visual acuity: OD: OS:

Best corrected visual acuity:OD: OS:

Refractive error OD: OS:

Intra ocular pressure(AT): OD: OS:

Anterior segment examination: Slit lamp biomicroscopy:

Others: Neovascular glaucoma

Fundus:

Media:

Disc size:

Shape:

Colour:

CD ratio:

Neuroretinal rim:

A:V ratio:

Background retina: ST SN IT IN

1) Microaneurysms

2) Dot& blot haemorrhages

3) Hard exudates

4) Venous dilatation

5) Venous beading

6) Intraretinal microvascular abnormalities

7) Neovascularisation disc

8) Neovascularisation elsewhere

9) Preretinal haemorrhages

10) Vitreous haemorrhage

11) Tractional retinal detachment

12) Clinically significant macular edema

13) Hypertensive retinopathy stage

14) Others

STAGE OF DIABETIC RETINOPATHY:

Investigations:

a) Urine microalbuminuria

b) Blood sugar FBS

PPBS

c) Blood urea

creatinine

d) Lipid profile

e) Hb

f) Glycosylated haemoglobin

g) FFA-Type of diabetic maculopathy

Stage of diabetic retinopathy

TREATMENT AND FOLLOW UP:

S.No	Name	Age	Sex	Occupation	Visittype	Def_dis_vn	def_near_vn	frequent glasscha	Metamorphopsia	def_field ofvn	Duration_comp	DM_dur_yrs	previous DR	HTN	Hypertension_dur	Hypercholesterol	Chol_dur	Anaemia	Obesity	Pedaledema	Fh_obesity	Fh_diabetes	Fh_HTN	Fh_DR1	Smoking	Alcohol	Treatmenthistory	Trt_nonadherence	Awareness	BCVA	IOP	Cornea	AC	Pupil	Lens	EOM
1	Thangaraj	58	1	chine oper	1	1	0	0	0	0	7.00	10.00	0	1	1.00	0	0.00	0	0	0	0	1	0	0	1	1	2	0.00	1	0.2	14	2	2	2	1	2
2	Thangaraj	58	1	chine oper	1	1	0	0	0	0	7.00	10.00	0	1	1.00	0	0.00	0	0	0	0	1	0	0	1	1	2	0.00	1	0.2	16	2	1	2	1	2
3	Kulalamani	52	2	housewife	1	1	0	0	0	0	2.00	2.00	0	0	0.00	0	0.00	0	0	0	0	1	0	0	0	0	1	0.00	2	1.0	16	2	1	1	2	2
4	Kulalamani	52	2	housewife	1	1	0	0	0	0	2.00	2.00	0	0	0.00	0	0.00	0	0	0	0	1	0	0	0	0	1	0.00	2	1.2	12	2	1	1	2	2
5	Sornam	54	1	driver	1	1	0	0	0	0	2.50	4.00	0	0	0.00	0	0.00	0	0	1	0	0	0	0	1	1	2	0.00	1	0.6	14	2	1	2	1	2
6	Sornam	54	1	driver	1	1	0	0	0	0	2.50	4.00	0	0	0.00	0	0.00	0	0	1	0	0	0	0	1	1	2	0.00	1	0.3	14	2	1	2	1	2
7	Kandhan	72	1	EB	2	1	1	0	0	0	1.00	6.50	0	0	0.00	0	0.00	0	0	0	0	0	0	0	1	0	2	0.00	1	1.0	16	2	1	2	3	2
8	Kandhan	72	1	EB	2	1	1	0	0	0	1.00	6.50	0	0	0.00	0	0.00	0	0	0	0	0	0	0	1	0	2	0.00	1	0.5	16	2	1	2	3	2
9	kumar	40	1	Watchmar	1	0	1	0	0	0	0.25	15.00	0	0	0.00	0	0.00	0	0	0	0	0	0	0	0	0	1	0.00	1	2.0	17	2	1	2	1	2
10	kumar	40	1	Watchmar	1	0	1	0	0	0	0.25	15.00	0	0	0.00	0	0.00	0	0	0	0	0	0	0	0	0	1	0.00	1	1.0	17	2	1	2	1	2
11	Muthu	60	1	ocial work	1	0	1	0	0	0	0.80	10.00	0	0	0.00	0	0.00	0	0	0	0	0	0	0	0	1	2	0.00	1	1.0	12	2	1	1	3	2
12	Muthu	60	1	ocial work	1	#NULL!	#NULL!	#NULL!	#NULL!	#NULL!	0.80	10.00	0	0	0.00	0	0.00	0	0	0	0	0	0	0	0	1	2	0.00	1	0.8	14	1	1	1	4	2
13	Murugan	50	1	mechanic	1	1	0	0	0	0	1.00	20.00	0	0	0.00	0	0.00	0	0	0	0	0	0	0	1	1	1	0.00	1	0.3	10	2	1	1	2	2
14	Murugan	50	1	mechanic	1	1	0	0	0	0	1.00	20.00	0	0	0.00	0	0.00	0	0	0	0	0	0	0	1	1	1	0.00	1	0.3	10	2	1	1	2	2
15	Siluvaidasan	56	1	fisherman	1	1	1	0	0	0	1.00	3.00	0	0	0.00	0	0.00	0	0	0	0	0	0	0	1	1	2	0.00	2	0.5	16	2	1	1	2	2
15	Siluvaidasan	56	1	fisherman	1	1	1	0	0	0	1.00	3.00	0	0	0.00	0	0.00	0	0	0	0	0	0	0	1	1	2	0.00	2	0.5	16	2	1	1	2	2
17	Pandi	56	1	labourer	1	1	0	0	0	0	2.00	3.00	0	0	0.00	0	0.00	0	0	0	0	0	0	0	1	0	2	0.00	2	1.0	16	2	1	1	2	2
18	Pandi	56	1	labourer	1	1	0	0	0	0	2.00	3.00	0	0	0.00	0	0.00	0	0	0	0	0	0	0	1	0	2	0.00	2	0.0	16	2	1	1	3	2
19	Muthulakshmi	60	2	housewife	1	1	0	0	0	0	1.00	0.25	0	1	0.25	0	0.00	0	0	0	0	0	0	0	0	0	2	0.00	1	0.2	14	2	1	1	3	2
20	Muthulakshmi	60	2	housewife	1	1	0	0	0	0	1.00	0.25	0	1	0.25	0	0.00	0	0	0	0	0	0	0	0	0	2	0.00	1	0.5	14	2	1	1	3	2
21	malliga	42	2	housewife	1	1	0	0	0	0	2.00	2.00	0	1	5.00	0	0.00	0	1	0	0	0	0	0	0	0	2	0.00	0	1.2	14	2	1	1	1	2
22	malliga	42	2	housewife	1	1	0	0	0	0	2.00	2.00	0	1	5.00	0	0.00	0	1	0	0	0	0	0	0	0	2	0.00	0	1.1	14	2	1	1	1	2
23	ramakrishnan	70	1	coolie	1	1	0	0	0	0	2.00	10.00	0	1	10.00	0	0.00	0	0	0	0	0	0	0	0	0	1	0.00	1	0.3	12	2	1	1	3	2
24	ramakrishnan	70	1	coolie	1	1	0	0	0	0	2.00	10.00	0	1	10.00	0	0.00	0	0	0	0	0	0	0	0	0	1	0.00	1	0.5	12	2	1	1	3	2
25	muthupattan	67	1	Labourer	1	1	0	0	0	1	4.00	4.00	0	0	0.00	0	0.00	0	0	1	0	0	0	0	1	0	2	0.00	0	1.3	11	2	1	2	2	2
26	muthupattan	67	1	Labourer	1	1	0	0	0	1	4.00	4.00	0	0	0.00	0	0.00	0	0	1	0	0	0	0	1	0	2	0.00	0	1.3	11	2	1	2	2	2
27	nambi	72	1	ocial work	1	1	0	0	0	0	7.00	33.00	0	0	2.00	0	0.00	0	0	0	0	1	1	0	1	0	3	0.00	3	2.0	14	2	1	1	2	2
28	nambi	72	1	ocial work	1	1	0	0	0	0	7.00	33.00	0	0	2.00	0	0.00	0	0	0	0	1	1	0	1	0	3	0.00	3	0.5	14	2	1	1	2	2
29	vasanthavalli	50	2	housewife	1	1	0	0	0	0	0.50	15.00	0	1	0.50	0	0.00	0	1	0	1	1	1	0	0	0	1	0.00	2	1.3	10	2	1	1	2	2
30	vasanthavalli	50	2	housewife	1	1	0	0	0	0	0.50	15.00	0	1	0.50	0	0.00	0	1	0	1	1	1	0	0	0	1	0.00	2	3.0	10	2	1	1	3	2
31	paulduraj	59	1	farmer	1	1	1	0	0	0	0.50	20.00	0	0	0.00	0	0.00	1	0	0	0	1	0	0	0	0	1	0.00	3	1.0	14	2	1	1	2	2
32	paulduraj	59	1	farmer	1	1	1	0	0	0	0.50	20.00	0	0	0.00	0	0.00	1	0	0	0	1	0	0	0	0	1	0.00	3	0.6	14	2	1	1	2	2
33	baskaran	55	1	canteenw	1	1	0	0	0	0	0.25	10.00	0	1	10.00	0	0.00	1	0	0	0	0	0	0	1	1	2	0.00	0	0.2	12	2	1	1	3	2
34	baskaran	55	1	canteenw	1	1	0	0	0	0	0.25	10.00	0	1	10.00	0	0.00	1	0	0	0	0	0	0	1	1	2	0.00	0	0.2	12	2	1	1	3	2
35	saraswathy	65	2	housewife	1	1	0	0	0	0	1.50	5.00	1	1	4.00	0	0.00	1	0	0	0	1	1	0	0	0	2	0.00	1	0.5	14	2	1	1	3	2
36	saraswathy	65	2	housewif	1	1	0	0	0	0	1.50	5.00	1	1	4.00	0	0.00	1	0	0	0	1	1	0	0	0	2	0.00	1	1.0	16	2	1	1	3	2
37	william	45	2	electric	1	1	0	0	1	0	0.25	6.00	0	0	0.00	0	0.00	0	0	0	0	0	0	0	1	1	2	0.00	2	1.0	12	2	1	1	2	2
38	william	45	2	electric	1	1	0	0	1	0	0.25	6.00	0	0	0.00	0	0.00	0	0	0	0	0	0	0	1	1	2	0.00	2	3.0	12	2	1	1	2	2
39	Basha	69	1		1	1	0	0	0	0	0.25	10.00	0	0	0.00	0	0.00	0	0	0	0	0	0	0	0	0	2	0.00	3	0.3	10	2	1	1	2	2
40	Basha	69	1		1	1	0	0	0	0	0.25	10.00	0	0	0.00	0	0.30	0	0	0	0	0	0	0	0	0	2	0.00	3	0.3	10	2	1	1	2	2
41	pitchammal	44	2	housewife	1	1	0	0	0	0	0.50	17.00	0	0	0.00	0	0.00	1	0	0	0	0	1	0	0	0	1	0.00	2	0.2	12	2	1	1	1	2
42	pitchammal	44	2	housewife	1	1	0	0	0	0	0.50	17.00	0	0	0.00	0	0.00	1	0	0	0	0	1	0	0	0	1	0.00	2	0.0	11	2	1	1	1	2
43	veerasamy	65	1	coolie	1	1	0	0	0	0	0.50	15.00	0	0	0.00	0	0.00	0	0	0	0	0	0	0	0	0	1	0.00	2	0.6	16	2	1	2	2	2
44	veerasamy	65	1	coolie	1	1	0	0	0	0	0.50	15.00	0	0	0.00	0	0.00	0	0	0	0	0	0	0	0	0	1	0.00	2	1.0	16	2	1	2	2	2
45	ramasamy	48	1	farmer	1	1	0	0	0	0	1.00	4.00	0	0	0.00	0	0.00	0	0	0	0	0	0	0	0	0	2	0.00	0	0.6	14	2	1	2	2	2
46	ramasamy	48	1	farmer	1	1	0	0	0	0	1.00	4.00	0	0	0.00	0	0.00	0	0	0	0	0	0	0	0	0	2	0.00	0	1.3	14	2	1	2	2	2
47	eskkiammal	70	2	housewife	1	1	0	0	0	0	0.50	20.00	0	1	1.00	1	0.50	0	0	0	0	0	0	0	0	0	2	0.00	0	1.0	20	2	1	2	2	2
48	eskkiammal	70	2	housewife	1	1	0	0	0	0	0.50	20.00	0	1	1.00	1	0.50	0	0	0	0	0	0	0	0	0	2	0.00	0	1.3	18	2	1	2	2	2
49	mohd.hussain	60	1	shopkeep	1	1	0	0	1	0	0.50	2.00	0	1	2.00	0	0.00	0	0	0	0	0	0	0	0	0	1	0.00	3	4.0	50	1	1	2	3	2
50	mohd.hussain	60	1	shopkeep	1	1	0	0	0	0	0.50	2.00	0	1	2.00	0	0.00	0	0	0	0	0	0	0	0	0	1	0.00	3	#NULL!	10	1	1	2	2	2
51	esther	52	2	housewife	1	1	0	0	0	0	0.25	17.00	0	0	0.00	0	0.00	0	0	0	0	0	0	0	0	0	2	1.00	3	1.2	17	2	1	1	2	2
52	esther	52	2	housewife	1	1	0	0	0	0	0.25	17.00	0	0	0.00	0	0.00	0	0	0	0	0	0	0	0	0	2	1.00	3	1.3	17	2	1	1	2	2
53	mohd. masooth	58	1	Carpenter	1	1	0	0	0	0	1.00	1.00	0	0	0.00	0	0.00	0	0	0	0	0	0	0	0	0	2	0.00	1	0.6	20	2	1	2	1	2
54	mohd. masooth	58	1	Carpenter	1	1	0	0	0	0	1.00	1.00	0	0	0.00	0	0.00	0	0	0	0	0	0	0	0	0	2	0.00	1	0.2	20	2	1	2	1	2
55	krishnankutty	71	1		1	1	0	0	0	0	1.00	2.00	0	0	0.00	0	0.00	0	0	0	0	0	0	0	0	0	2	0.00	2	3.0	29	2	1	1	2	2
56	krishnankutty	71	1		1	1	0	0	0	0	0.25	2.00	0	0	0.00	0	0.00	0	0	0	0	0	0	0	0	0	2	0.00	2	2.0	19	2	1	1	4	2
57	george	61	1		1	1	0	0	0	0	0.25	15.00	0	0	0.00	0	1.00	0	0	0	0	0	0	0	0	0	2	0.00	2	1.0	14	2	1	1	2	2
58	george	61	1		1	1	0	0	0	0	0.25	15.00	0	0	0.00	0	0.00	0	0	0	0	0	0	0	0	0	2	0.00	2	1.0	14	2	1	1	2	2
59	fathima beevi	58	2	housewife	1	1	0	0	0	0	0.05	3.00	0	0	0.00	0	0.00	0	0	0	0	0	0	0	0	0	2	0.00	1	2.0	12	2	1	1	3	2
60	fathima beevi	58	2	housewife	1	1	0	0	0	0	0.05	3.00	0	0	0.00	0	0.00	0	0	0	0	0	0	0	0	0	2	0.00	1	0.5	11	2	1	1	3	2
61	anthony rajan	58	1		1	1	0	0	0	0	0.50	6.00	0	0	0.00	0	0.00	0	0	0	0	0	0	0	0	0	2	0.00	2	0.3	18	2	1	2	1	2
62	anthony rajan	58	1		1	1	0	0	0	0	1.00	6.00	0	0	0.00	0	0.00	0	0	0	0	0	0	0	0	0	2	0.00	2	1.1	17	2	1	2	1	2
63	seethalaxmi	44	2	housewife	1	1	0	0	0	0	0.13	4.00	0	0	0.00	0	0.00	0	0	0	0	0	0	0	0	0	2	0.00	3	0.2	14	2	1	1	1	2
64	seethalaxmi	44	2	housewife	1	1	0	0	0	0	1.00	4.00	0	0	0.00	0	0.00	0	0	0	0	0	0	0	0	0	2	0.00	3	0.3	12	2	1	1	1	2
65	Syed mohd.	62	1		1	1	0	0	0	0	0.50	6.00	0	0	0.00	0	0.00	0	0	0	0	0	0	0	0	0	2	1.00	1	0.0	17	2	1	2	3	2
66	Syed mohd.	62	1		1	1	0	0	0	0	0.50	6.00	0	0	0.00	0	0.00	0	0	0	0	0	0	0	0	0	2	1.00	1	3.0	15	2	1	2	3	2
67	Balasubramaniya	56	1	shopkeepe	1	1	1	0	0	0	2.00	5.00	0	1	3.00	0	0.00	0	0	0	0	1	0	0	1	0	2	0.00	3	3.0	36	2	1	2	2	2
68	Balasubramaniya	56	1	shopkeepe	1	1	1	0	0	0	2.00	5.00	0	1	3.00	0	0.00	0	0	0	0	1	0	0	1	0	2	0.00	3	0.0	17	2	1	2	2	2
69	Abdul jabbar	49	1	carpenter	1	1	0	0	0	0	2.00	7.00	1	1	3.00	0	0.00	0	1	0	0	0	0	0	0	0	2	0.00	2	1.2	13	2	1	2	1	2
70	Abdul jabbar	49	1	carpenter	1	1	0	0	0	0	2.00	7.00	1	1	3.00	0	0.00	0	1	0	0	0	0	0	0	0	2	0.00	2	0.2	14	2	1	2	1	2
71	Saraswathy	45	2	Housewife	1	1	0	0	0	0	1.50	15.00	1	0	0.00	0	0.00	0	0	0	0	0	0	0	0	0	1	0.00	2	0.6	20	2	1	1	2	2

S.No	Name	Age	Sex	Occupation	Visittype	Def_dis_vn	def_near_vn	frequent glasscha	Metamorphopsia	def_field ofvn	Duration_comp	DM_dur_yrs	previous DR	HTN	Hypertension_dur	Hypercholesterol	Chol_dur	Anaemia	Obesity	Pedaledema	Fh_obesity	Fh_diabetes	Fh_HTN	Fh_DR1	Smoking	Alcohol	Treatmenthistory	Trt_nondherence	Awareness	BCVA	IOP	Cornea	AC	Pupil	Lens	EOM
72	Saraswathy	45	2	Housewife	1	1	0	0	0	0	1.50	15.00	1	0	0.00	0	0.00	0	0	0	0	0	0	0	0	0	1	0.00	2	0.3	15	2	1	1	2	2
73	Subramanian	54	1	Teacher	1	1	0	0	0	0	0.08	16.00	0	0	0.00	0	0.00	0	0	0	0	0	0	0	0	0	1	0.00	1	0.3	20	2	1	1	3	2
74	Subramanian	54	1	Teacher	1	1	0	0	0	0	0.08	16.00	0	0	0.00	0	0.00	0	0	0	0	0	0	0	0	0	1	0.00	1	0.2	20	2	1	1	3	2
75	chellapandiyan	46	1	Business	1	1	0	0	0	0	0.16	13.00	1	0	0.00	0	0.00	0	1	0	0	0	0	0	0	0	2	1.00	1	0.6	11	2	1	2	1	2
76	chellapandiyan	46	1	Business	1	1	0	0	0	0	0.16	13.00	1	0	0.00	0	0.00	0	1	0	0	0	0	0	0	0	2	1.00	1	0.3	12	2	1	2	1	2
77	Thangaraj	62	1	Farmer	1	1	0	0	0	0	0.04	15.00	0	0	0.00	0	0.00	0	0	0	0	0	0	0	0	0	2	0.00	1	3.0	17	2	1	2	1	2
78	Thangaraj	62	1	Farmer	1	1	0	0	0	0	0.04	15.00	0	0	0.00	0	0.00	0	0	0	0	0	0	0	0	0	2	0.00	1	0.3	20	2	1	2	1	2
79	Muthaiah	70	1	Business	1	1	0	0	0	0	1.00	1.00	0	0	0.00	0	0.00	0	0	0	0	0	0	0	0	0	1	0.00	2	1.0	15	2	2	2	2	2
80	Muthaiah	70	1	Business	1	1	0	0	0	0	1.00	1.00	0	0	0.00	0	0.00	0	0	0	0	0	0	0	0	0	1	0.00	2	0.2	10	2	2	2	2	2
81	Arpudha selvi	48	2	Housewife	1	1	0	0	0	0	0.50	10.00	0	0	0.00	0	0.00	0	1	0	0	0	0	0	0	0	2	0.00	2	0.5	17	2	1	1	2	2
82	Arpudha selvi	48	2	Housewife	1	1	0	0	0	0	0.50	10.00	0	0	0.00	0	0.00	0	1	0	0	0	0	0	0	0	2	0.00	2	0.5	18	2	1	1	2	2
83	Shenbagavalli	57	2	Housewife	1	1	0	0	0	0	0.25	8.00	0	0	0.00	0	0.00	0	0	0	0	0	0	0	0	0	2	0.00	1	0.6	14	2	1	2	2	2
84	Shenbagavalli	57	2	Housewife	1	1	0	0	0	0	0.25	8.00	0	0	0.00	0	0.00	0	0	0	1	0	0	0	0	0	2	0.00	1	0.8	14	2	1	2	2	2
85	Sasikumaran	58	1	Teacher	1	1	0	0	0	0	1.00	15.00	0	1	10.00	1	2.00	0	0	0	0	0	0	0	0	0	1	0.00	1	0.2	19	2	1	1	2	2
86	Sasikumaran	58	1	Teacher	1	1	0	0	0	0	1.00	15.00	0	1	10.00	1	2.00	0	0	0	0	0	0	0	0	0	1	0.00	1	0.3	19	2	1	1	2	2
87	Ramachandran	60	1	Manager	1	1	1	0	0	0	3.00	25.00	1	1	2.00	0	0.00	0	0	0	0	0	0	0	0	0	1	0.00	3	0.3	19	2	1	1	2	2
88	Ramachandran	60	1	Manager	1	1	1	0	0	0	3.00	25.00	1	1	2.00	0	0.00	0	0	0	0	0	0	0	0	0	1	0.00	3	0.5	15	2	1	1	3	2
89	Eliyas samuel	64	1	Mechanic	1	1	0	0	0	0	1.00	14.00	0	1	4.00	0	0.00	0	1	0	1	0	0	0	0	0	2	0.00	3	0.0	14	2	1	2	1	2
90	Eliyas samuel	64	1	Mechanic	1	1	0	0	0	0	1.00	14.00	0	1	4.00	0	0.00	0	1	0	1	0	0	0	0	0	2	0.00	3	0.5	17	2	1	2	1	2
91	Rasheeda	48	2	eedi work	1	1	1	0	0	0	1.00	12.00	0	1	12.00	0	0.00	0	0	0	0	0	0	0	0	0	2	0.00	1	0.0	17	2	1	1	2	2
92	Rasheeda	48	2	eedi work	1	1	1	0	0	0	1.00	12.00	0	1	12.00	0	0.00	0	0	0	0	0	0	0	0	0	2	0.00	1	0.3	17	2	1	1	2	2
93	Fathima	55	2	Housewife	1	1	1	0	0	0	0.16	17.00	0	1	17.00	0	0.00	0	1	0	0	0	0	0	0	0	2	0.00	1	0.3	18	2	1	2	1	2
94	Fathima	55	2	Housewife	1	1	1	0	0	0	0.16	17.00	0	1	17.00	0	0.00	0	1	0	0	0	0	0	0	0	2	0.00	1	0.3	18	2	2	2	1	2
95	Rathinaraj	52	1	Mill worke	1	1	0	0	0	0	0.50	6.00	0	0	0.00	0	0.00	0	1	0	1	0	0	0	0	0	2	0.00	1	0.2	12	2	1	1	2	2
96	Rathinaraj	52	1	Mill worke	1	1	0	0	0	0	0.50	6.00	0	0	0.00	0	0.00	0	1	0	1	0	0	0	0	0	2	0.00	1	0.5	12	2	1	2	2	2
97	Maria Thangam	44	2	Housewife	1	1	0	0	0	0	2.00	4.00	0	0	0.00	0	0.00	0	0	0	0	0	0	0	0	0	2	0.00	1	1.0	10	2	1	2	2	2
98	Maria Thangam	44	2	Housewife	1	1	0	0	0	0	2.00	4.00	0	0	0.00	0	0.00	0	0	0	0	0	0	0	0	0	2	0.00	1	1.1	10	2	1	2	2	2
99	Arumai perumal	68	1	BSNL	1	1	0	0	0	0	0.50	14.00	0	0	0.00	0	0.00	0	0	0	0	0	0	0	0	0	1	0.00	3	0.0	16	2	1	2	3	2
100	Arumai perumal	68	1	BSNL	1	1	0	0	0	0	0.50	14.00	0	0	0.00	0	0.00	0	0	0	0	0	0	0	0	0	1	0.00	3	0.0	16	2	1	2	3	2
101	Vinston	71	1	Manager	1	1	0	0	0	0	0.50	35.00	0	1	25.00	0	0.00	0	1	0	1	0	0	0	0	0	2	0.00	3	0.0	16	2	1	2	2	2
102	Vinston	71	1	Manager	1	1	0	0	0	0	0.50	35.00	0	1	25.00	0	0.00	0	1	0	1	0	0	0	0	0	2	0.00	3	0.2	17	2	1	2	2	2
103	Abdul rasheed	55	1	Watchman	1	1	0	0	0	0	0.50	20.00	0	0	0.00	0	0.00	0	0	0	0	0	0	0	0	0	2	0.00	2	0.2	14	2	2	1	1	2
104	Abdul rasheed	55	1	Watchman	1	1	0	0	0	0	0.50	20.00	0	0	0.00	0	0.00	0	0	0	0	0	0	0	0	0	2	0.00	2	0.0	14	2	2	1	1	2
105	Peruma Pillai	64	2	Housewife	1	1	1	0	0	0	0.50	20.00	0	1	3.00	0	0.00	0	1	0	0	0	0	0	0	0	2	0.00	3	0.3	12	2	1	2	3	2
106	Peruma Pillai	64	2	Housewife	1	1	1	0	0	0	0.50	20.00	0	1	3.00	0	0.00	0	1	0	0	0	0	0	0	0	2	0.00	3	0.6	20	2	1	2	2	2
107	Annamal	54	2	Housewife	1	1	0	0	0	0	0.60	20.00	0	0	0.00	0	0.00	0	0	0	0	0	0	0	0	0	2	0.00	0	0.2	18	2	1	1	1	2
108	Annamal	54	2	Housewife	1	1	0	0	0	0	0.60	20.00	0	0	0.00	0	0.00	0	0	0	0	0	0	0	0	0	2	0.00	0	0.8	14	2	1	2	1	2
109	Iyyammal	60	2	eedi work	1	1	0	0	0	0	0.25	6.00	0	0	3.00	0	0.00	0	0	0	0	0	0	0	0	0	2	0.00	2	0.8	16	2	1	1	2	2
110	Iyyammal	60	2	eedi work	1	1	0	0	0	0	0.25	6.00	0	0	3.00	0	0.00	0	0	0	0	0	0	0	0	0	2	0.00	2	0.2	16	2	1	1	2	2
111	Babu Rajen	53	1	Welder	1	1	0	0	0	1	1.00	15.00	1	0	0.00	0	0.00	0	0	0	0	0	0	0	0	0	1	0.00	1	0.0	18	2	1	2	2	2
112	Babu Rajen	53	1	Welder	1	1	0	0	0	1	1.00	15.00	1	0	0.00	0	0.00	0	0	0	0	0	0	0	0	0	1	0.00	1	0.6	16	2	1	2	2	2
113	Sivasubramanian	59	1	Teacher	1	1	1	0	0	0	0.90	25.00	0	1	20.00	0	0.00	0	0	0	0	1	0	0	0	0	2	1.00	2	0.6	12	2	1	2	1	2
114	Sivasubramanian	59	1	Teacher	1	1	1	0	0	0	0.90	25.00	0	1	20.00	0	0.00	0	0	0	0	1	0	0	0	0	2	1.00	2	0.3	12	2	1	2	1	2
115	Nellaiappan	51	1	clerk	1	1	0	0	0	0	0.50	10.00	0	0	0.00	0	0.00	0	0	0	0	0	0	0	0	0	2	0.00	2	0.3	17	2	1	2	1	2
116	Nellaiappan	51	1	clerk	1	1	0	0	0	0	0.50	10.00	0	0	0.00	0	0.00	0	0	0	0	0	0	0	0	0	2	0.00	2	0.2	15	2	1	2	1	2
117	Rajamani	56	1	cooly	1	1	0	0	0	0	1.00	5.00	0	0	0.00	0	0.00	0	0	0	0	0	0	0	0	0	2	0.00	1	0.3	12	2	1	2	2	2
118	Rajamani	56	1	cooly	1	1	0	0	0	0	1.00	5.00	0	0	0.00	0	0.00	0	0	0	0	0	0	0	0	0	2	0.00	1	0.2	14	2	1	2	2	2
119	Maragadha selvi	41	2	Housewife	1	1	1	0	0	0	2.00	6.00	1	1	1.00	0	0.00	0	0	0	0	0	0	0	0	0	2	0.00	2	0.2	16	2	1	1	2	2
120	Maragadha selvi	41	2	Housewife	1	1	1	0	0	0	2.00	6.00	1	1	1.00	0	0.00	0	0	0	0	0	0	0	0	0	2	0.00	2	0.6	16	2	1	1	2	2
121	Mayaperumal	56	1	Farmer	1	1	0	0	0	0	0.08	10.00	0	1	0.02	0	0.00	0	0	0	0	0	0	0	0	0	2	0.00	1	0.5	17	2	1	2	2	2
121	Mayaperumal	56	1	Farmer	1	1	0	0	0	0	0.08	10.00	0	1	0.02	0	0.00	0	0	0	0	0	0	0	0	0	2	0.00	1	0.2	15	2	1	1	2	2
123	Rahamath	58	1	Teacher	1	1	0	0	0	0	4.00	15.00	0	1	10.00	0	0.00	0	1	0	0	0	0	0	0	0	2	0.00	2	0.2	16	2	1	1	2	2
124	Rahamath	58	1	Teacher	1	1	0	0	0	0	4.00	15.00	0	1	10.00	0	0.00	0	1	0	0	0	0	0	0	0	2	0.00	2	0.2	17	2	1	1	2	2
125	Sam Luther	56	1	Plumber	1	1	0	0	0	0	0.08	10.00	0	0	0.00	0	0.00	0	0	0	0	0	0	0	0	0	3	0.00	1	0.6	14	2	1	2	2	2
126	Sam Luther	56	1	Plumber	1	1	0	0	0	0	0.08	10.00	0	0	0.00	0	0.00	0	0	0	0	0	0	0	0	0	3	0.00	1	0.3	15	2	1	2	2	2
127	Kandasamy	54	1	Mill worke	1	1	0	0	0	0	1.00	16.00	0	1	1.00	0	0.00	0	0	0	0	0	0	0	0	0	1	1.00	3	0.0	14	2	2	1	1	2
128	Kandasamy	54	1	Mill worke	1	1	0	0	0	0	1.00	16.00	0	1	1.00	0	0.00	0	0	0	0	0	0	0	0	0	1	1.00	3	2.0	14	2	2	1	2	2
129	Shenbagam	53	2	Housewife	1	1	0	0	0	0	0.50	12.00	0	0	0.00	0	0.00	0	0	0	0	0	0	0	0	0	3	0.00	2	0.2	18	2	1	1	2	2
130	Shenbagam	53	2	Housewife	1	1	0	0	0	0	0.50	12.00	0	0	0.00	0	0.00	0	0	0	0	0	0	0	0	0	3	0.00	2	0.5	16	2	1	1	2	2
131	Rajan	60	1		1	1	0	0	0	0	0.25	5.00	0	1	5.00	0	0.00	0	0	0	0	0	0	0	0	0	3	0.00	1	0.2	22	2	1	2	3	2
132	Rajan	60	1		1	1	0	0	0	0	0.25	5.00	0	1	5.00	0	0.00	0	0	0	0	0	0	0	0	0	3	0.00	1	0.6	15	2	1	2	3	2
133	Ramasamy	70	1	cooly	1	1	0	0	0	0	0.04	5.00	0	1	5.00	0	0.00	0	0	0	0	0	0	0	0	0	2	0.00	3	3.0	14	2	1	2	3	2
134	Ramasamy	70	1	cooly	1	1	0	0	0	0	0.04	5.00	0	1	5.00	0	0.00	0	0	0	0	0	0	0	0	0	2	0.00	3	1.0	14	2	1	2	3	2
135	Meera	56	2	Housewife	1	1	0	0	0	0	0.16	13.00	0	1	13.00	0	0.00	0	0	0	0	1	0	0	0	0	2	0.00	3	0.6	14	2	1	2	2	2
136	Meera	56	2	Housewife	1	1	0	0	0	0	0.16	13.00	0	1	13.00	0	0.00	0	0	0	0	1	0	0	0	0	2	0.00	3	0.6	14	2	1	2	2	2
137	Pitchaikani	65	1	Mason	1	1	0	0	0	0	1.00	15.00	0	0	0.00	0	0.00	0	0	0	0	0	0	0	0	0	1	0.00	1	0.5	14	2	1	1	2	2
138	Pitchaikani	65	1	Mason	1	1	0	0	0	0	1.00	15.00	0	0	0.00	0	0.00	0	0	0	0	0	0	0	0	0	1	0.00	1	0.5	15	2	1	1	2	2
139	Gurunathan	56	1	Shopkeepe	1	1	0	0	0	0	1.00	1.00	0	0	0.00	0	0.00	0	0	0	0	0	0	0	0	0	2	0.00	2	1.4	14	2	1	2	2	2
140	Gurunathan	56	1	Shopkeepe	1	1	0	0	0	0	1.00	1.00	0	0	0.00	0	0.00	0	0	0	0	0	0	0	0	0	2	0.00	2	0.6	14	2	1	2	3	2
141	Madasamy	61	1	cooly	1	1	0	0	0	0	5.00	20.00	0	0	0.00	0	0.00	0	0	0	0	0	0	0	0	0	2	0.00	1	0.6	10	2	2	2	2	2
142	Madasamy	61	1	cooly	1	1	0	0	0	0	5.00	20.00	0	0	0.00	0	0.00	0	0	0	0	0	0	0	0	0	2	0.00	1	0.0	8	2	2	2	1	2

S.No	Name	Age	Sex	Occupation	Visittype	Def_dis_vn	def_near_vn	frequent glasscha	Metamorphopsia	def_field ofvn	Duration_comp	DM_dur_yrs	previous DR	HTN	Hypertension_dur	Hypercholesterol	Chol_dur	Anaemia	Obesity	Pedaledema	Fh_obesity	Fh_diabetes	Fh_HTN	Fh_DR1	Smoking	Alcohol	Treatmenthistory	Trt_nonadherence	Awareness	BCVA	IOP	Cornea	AC	Pupil	Lens	EOM
143	Chidambaram	67	1	Business	1	1	1	0	0	0	0.50	6.00	0	1	1.00	0	0.00	0	0	0	0	0	0	0	0	0	2	0.00	1	0.2	12	2	2	1	2	2
144	Chidambaram	67	1	Business	1	1	1	0	0	0	0.50	6.00	0	1	1.00	0	0.00	0	0	0	0	0	0	0	0	0	2	0.00	1	0.8	10	2	2	1	2	2
145	Thangasamy	54	1	driver	1	1	1	0	0	0	0.50	0.50	0	0	0.00	0	0.00	0	0	0	0	0	0	0	0	0	2	1.00	1	0.3	17	2	1	1	1	2
146	Thangasamy	54	1	driver	1	1	1	0	0	0	0.50	0.50	0	0	0.00	0	0.00	0	0	0	0	0	0	0	0	0	2	1.00	1	0.0	16	2	1	1	1	2
147	Nirmala	48	2	Housewife	1	0	0	0	0	0	0.00	10.00	0	0	0.08	0	0.00	1	0	0	0	0	0	0	0	0	2	1.00	0	1.0	14	2	1	1	2	2
148	Nirmala	48	2	Housewife	1	0	0	0	0	0	0.00	10.00	0	0	0.08	0	0.00	1	0	0	0	0	0	0	0	0	2	1.00	0	1.0	14	2	1	1	2	2
149	Sundari	59	2	eedi work	1	1	1	0	0	0	0.16	3.00	0	1	3.00	0	0.00	0	0	0	0	0	0	0	0	0	2	0.00	0	0.8	15	2	1	1	2	2
150	Sundari	59	2	eedi work	1	1	1	0	0	0	0.16	3.00	0	1	3.00	0	0.00	0	0	0	0	0	0	0	0	0	2	0.00	0	0.8	14	2	1	1	2	2
151	Mohd. Ayum khan	53	1	Tea stall	1	1	0	0	0	0	0.50	12.00	0	0	0.00	0	0.00	0	0	0	0	0	0	1	0	0	2	0.00	0	0.5	14	2	1	2	2	2
152	Mohd. Ayum khan	53	1	Tea stall	1	1	0	0	0	0	0.50	12.00	0	0	0.00	0	0.00	0	0	0	0	0	0	1	0	0	2	0.00	0	0.5	14	2	1	2	2	2
153	Hepsi bhai	42	2	Housewife	1	1	0	0	0	0	0.50	10.00	0	1	0.02	0	0.00	0	0	0	0	0	0	0	0	0	2	0.00	1	1.0	12	2	1	2	2	2
154	Hepsi bhai	42	2	Housewife	1	1	0	0	0	0	0.50	10.00	0	1	0.02	0	0.00	0	0	0	0	0	0	0	0	0	2	0.00	1	1.0	12	2	1	2	2	2
155	Sahul Hameed	60	1	Manager	1	1	0	0	0	0	1.00	20.00	0	0	0.00	0	0.00	0	0	0	0	0	0	0	0	0	2	0.00	1	0.2	11	2	1	1	1	2
156	Sahul Hameed	60	1	Manager	1	1	0	0	0	0	1.00	20.00	0	0	0.00	0	0.00	0	0	0	0	0	0	0	0	0	2	0.00	1	0.5	11	2	1	1	1	2
157	Dharmaraja	73	1		1	1	0	0	0	0	0.75	4.00	0	1	1.00	0	0.00	0	0	0	0	0	0	0	0	0	2	0.00	2	0.8	13	2	1	1	2	2
158	Dharmaraja	73	1		1	1	0	0	0	0	0.75	4.00	0	1	1.00	0	0.00	0	0	0	0	0	0	0	0	0	2	0.00	2	1.1	22	2	1	2	2	2
159	Saraswathy	58	2	Housewife	1	1	0	0	0	0	1.00	22.00	0	1	2.00	0	0.00	0	0	0	0	0	0	0	0	0	2	0.00	1	0.3	14	2	1	1	2	2
160	Saraswathy	58	2	Housewife	1	1	0	0	0	0	1.00	22.00	0	1	2.00	0	0.00	0	0	0	0	0	0	0	0	0	2	0.00	1	0.2	12	2	1	1	2	2
161	Venkatachalam	50	1		1	1	0	0	0	0	0.16	10.00	0	0	0.00	0	0.00	0	0	0	0	0	0	0	0	0	2	0.00	2	0.0	11	2	1	1	1	2
162	Venkatachalam	50	1		1	1	0	0	0	0	0.16	10.00	0	0	0.00	0	0.00	0	0	0	0	0	0	0	0	0	2	0.00	2	0.0	11	2	1	1	1	2
163	Parvathy	53	2	Housewife	1	1	0	0	0	0	2.00	4.00	0	1	1.50	0	0.00	1	0	0	0	1	0	0	0	0	2	0.00	1	0.8	17	2	1	1	1	2
164	Parvathy	53	2	Housewife	1	1	0	0	0	0	2.00	4.00	0	1	1.50	0	0.00	1	0	0	0	1	0	0	0	0	2	0.00	1	0.2	15	2	1	1	1	2
165	Pushpam	60	2	Housewife	1	1	0	0	0	0	0.75	15.00	0	0	2.00	0	0.00	0	0	0	0	0	0	0	0	0	2	0.00	2	0.0	13	2	1	1	1	2
166	Pushpam	60	2	Housewife	1	1	0	0	0	0	0.75	15.00	0	0	2.00	0	0.00	0	0	0	0	0	0	0	0	0	2	0.00	2	0.0	15	2	1	1	1	2
167	Pattu kamala	51	2	Housewife	1	1	1	0	0	0	1.00	6.00	0	1	5.00	0	0.00	0	0	0	0	0	0	0	0	0	2	0.00	1	0.0	12	2	1	1	1	2
168	Pattu kamala	51	2	Housewife	1	1	1	0	0	0	1.00	6.00	0	1	5.00	0	0.00	0	0	0	0	0	0	0	0	0	2	0.00	1	0.0	12	2	1	1	1	2
169	Rajendran	46	1	Mechanic	1	1	0	0	0	0	0.50	5.00	0	0	0.00	0	0.00	0	0	1	0	0	0	0	0	0	2	0.00	2	0.2	15	2	1	1	1	2
170	Rajendran	46	1	Mechanic	1	1	0	0	0	0	0.50	5.00	0	0	0.00	0	0.00	0	0	1	0	0	0	0	0	0	2	0.00	2	0.5	13	2	1	1	1	2
171	Farook	58	1	Teacher	1	1	0	0	0	0	2.00	2.00	0	1	1.00	0	0.00	0	0	0	0	1	1	0	0	0	2	0.00	3	0.6	14	2	1	1	2	2
172	Farook	58	1	Teacher	1	1	0	0	0	0	2.00	2.00	0	1	1.00	0	0.00	0	0	0	0	1	1	0	0	0	2	0.00	3	0.5	14	2	1	1	2	2
173	Ramakrishnan	65	1	Carpenter	1	1	0	0	0	0	0.25	5.00	0	0	0.00	0	0.00	0	0	0	0	0	0	0	1	1	2	0.00	1	0.3	8	2	1	1	1	2
174	Ramakrishnan	65	1	Carpenter	1	1	0	0	0	0	0.25	5.00	0	0	0.00	0	0.00	0	0	0	0	0	0	0	1	1	2	0.00	1	0.6	10	2	1	1	1	2
175	Peer Mohamed	56	1	Mason	1	1	0	0	0	0	0.04	6.00	0	0	0.00	0	0.00	0	0	0	0	0	0	0	0	0	2	1.00	0	2.0	11	2	1	1	2	2
176	Peer Mohamed	56	1	Mason	1	1	0	0	0	0	0.04	6.00	0	0	0.00	0	0.00	0	0	0	0	0	0	0	0	0	2	1.00	0	0.2	10	2	1	1	2	2
177	Subramanian	61	1	hopkeepe	1	1	1	0	0	0	0.25	7.00	1	0	0.00	0	0.00	0	0	0	0	0	0	0	0	0	2	0.00	1	0.3	10	2	1	1	2	2
178	Subramanian	61	1	hopkeepe	1	1	1	0	0	0	0.25	7.00	1	0	0.00	0	0.00	0	0	0	0	0	0	0	0	0	2	0.00	1	1.3	9	2	1	1	2	2
179	Nagalakshmi	61	2	Housewife	2	1	0	0	0	0	1.00	15.00	0	0	0.00	0	0.00	0	1	0	0	0	0	0	0	0	2	1.00	1	0.6	13	2	1	2	3	2
180	Nagalakshmi	61	2	Housewife	2	1	0	0	0	0	1.00	15.00	0	0	0.00	0	0.00	0	1	0	0	0	0	0	0	0	2	1.00	1	3.0	12	2	1	2	3	2
181	Eswaran	72	1	Electrician	1	1	1	0	0	0	0.75	6.00	0	1	2.00	0	0.00	0	0	0	0	0	0	0	0	0	2	0.00	2	0.5	17	2	1	1	2	2
182	Eswaran	72	1	Electrician	1	1	1	0	0	0	0.75	6.00	0	1	2.00	0	0.00	0	0	0	0	0	0	0	0	0	2	0.00	2	1.0	17	2	1	1	2	2
183	Raju	55	1	alth inspe	1	0	1	0	0	0	0.08	7.00	0	0	0.00	0	0.00	0	1	0	0	0	0	0	1	1	2	0.00	3	0.0	16	2	1	1	1	2
184	Raju	55	1	alth inspe	1	0	1	0	0	0	0.08	7.00	0	0	0.00	0	0.00	0	1	0	0	0	0	0	1	1	2	0.00	3	0.0	18	2	1	1	1	2
185	Samikannu	51	1	clerk	1	1	0	0	0	0	0.50	10.00	0	0	0.00	0	0.00	0	0	0	0	0	0	0	0	0	2	0.00	2	0.3	17	2	1	2	1	2
186	Samikannu	51	1	clerk	1	1	0	0	0	0	0.50	10.00	0	0	0.00	0	0.00	0	0	0	0	0	0	0	0	0	2	0.00	2	0.2	15	2	1	2	1	2
187	Ismail	58	1	Teacher	1	1	0	0	0	0	2.00	2.00	0	1	1.00	0	0.00	0	0	0	0	1	1	0	0	0	2	0.00	3	0.6	14	2	1	1	2	2
188	Ismail	58	1	Teacher	1	1	0	0	0	0	2.00	2.00	0	1	1.00	0	0.00	0	0	0	0	1	1	0	0	0	2	0.00	3	0.8	14	2	1	1	2	2
189	Kandasamy	54	1	Mill worke	1	1	0	0	0	0	1.00	16.00	0	1	1.00	0	0.00	0	0	0	0	0	0	0	0	0	1	1.00	3	0.0	14	2	2	1	1	2
190	Kandasamy	54	1	Mill worke	1	1	0	0	0	0	1.00	16.00	0	1	1.00	0	0.00	0	0	0	0	0	0	0	0	0	1	1.00	3	2.0	14	2	2	1	2	2
191	Srinivasan	72	1	spital wor	1	1	0	0	0	0	7.00	33.00	0	1	2.00	0	0.00	0	0	0	0	1	1	0	1	0	3	0.00	3	2.0	14	2	1	1	2	2
192	Srinivasan	72	1	spital wor	1	1	0	0	0	0	7.00	33.00	0	1	2.00	0	0.00	0	0	0	0	1	1	0	1	0	3	0.00	3	0.5	14	2	1	1	2	2
193	Thangadurai	58	1	Farmer	1	1	0	0	0	0	7.00	10.00	0	1	1.00	0	0.00	0	0	0	0	1	0	0	1	1	2	0.00	1	0.2	14	2	2	2	1	2
194	Thangadurai	58	1	Farmer	1	1	0	0	0	0	7.00	10.00	0	1	1.00	0	0.00	0	0	0	0	1	0	0	1	1	2	0.00	1	0.2	16	2	1	2	1	2
195	Kannan	50	1	mechanic	1	1	0	0	0	0	1.00	20.00	0	0	0.00	0	0.00	0	0	0	0	0	0	0	1	1	1	0.00	1	0.3	10	2	1	1	2	2
196	Kannan	50	1	mechanic	1	1	0	0	0	0	1.00	20.00	0	0	0.00	0	0.00	0	0	0	0	0	0	0	1	1	1	0.00	1	0.3	10	2	1	1	2	2
197	Ramu	70	1	coolie	1	1	0	0	0	0	2.00	10.00	0	1	10.00	0	0.00	0	0	0	0	0	0	0	0	0	1	0.00	1	0.3	12	2	1	1	3	2
198	Ramu	70	1	coolie	1	1	0	0	0	0	2.00	10.00	0	1	10.00	0	0.00	0	0	0	0	0	0	0	0	0	1	0.00	1	0.5	12	2	1	1	3	2
199	Banumathy	58	2	housewife	1	1	0	0	0	0	0.50	3.00	0	0	0.00	0	0.00	0	0	0	0	0	0	0	0	0	2	0.00	1	2.0	12	2	1	1	3	2
200	Banumathy	58	2	housewife	1	1	0	0	0	0	0.50	3.00	0	0	0.00	0	0.00	0	0	0	0	0	0	0	0	0	2	0.00	1	0.5	11	2	1	1	3	2

Glaucoma	Anteriorvitreous	Remarks	Media	Reason	cat_sx	VH	CD_ratio	AV_ratio	HTR	BP_Systolic	BP_Diastolic	Albuminuria1	FBS	PPBS	Urea	Serum_cholestero	Creatinine	TGL	HDL	LDL	VLDL	TC_HDL ratio	LDLHDLratio	Hb	HbA1C	DR_stage	Maculopathy	Maculopathy1	Treatment1	Followup	Vision_1	Vision_2	Vision_3	dev_mac_edema	visualoutcome	Rx
2	2		1		0	0	0.30	4	1	156	94	0	214	311	31	187	1.2	112	42	90	64	4.45	2.14	12.4	#NULL!	2	2	1	6	1	0.2	0.2	0.2	0	2	6
2	2		1		0	0	0.30	4	1	156	94	0	214	311	31	187	1.2	112	42	90	64	4.45	2.14	12.4	#NULL!	3	2	1	6	1	0.2	0.2	0.2	0	2	6
2	2		0	PSC	0	0	0.30	1	2	134	82	0	210	277	21	154	1.4	132	28	84	54	5.50	3.00	10.5	#NULL!	1	2	1	6	1	1.0	1.0	1.0	0	2	6
2	2		0	PSC	0	0	0.30	1	2	134	82	0	210	277	21	154	1.4	132	28	84	54	5.50	3.00	10.5	#NULL!	1	2	1	6	1	1.3	1.3	1.3	0	1	6
2	2		0	IMC	0	0	0.30	4	2	122	72	1	241	412	36	176	1.5	145	40	91	62	4.40	2.28	11.0	#NULL!	5	2	1	6	1	0.5	0.5	0.5	0	3	6
2	2		0	IMC	0	0	0.30	4	2	122	72	1	241	412	36	176	1.5	145	40	91	62	4.40	2.28	11.0	#NULL!	2	2	1	6	1	0.3	0.3	0.3	0	2	6
2	2		1		0	0	0.30	4	0	138	88	0	149	302	49	157	1.9	219	35	102	74	4.49	2.91	12.7	#NULL!	1	1	1	5	1	0.8	0.8	0.8	0	3	5
2	2		1		0	0	0.30	4	0	138	88	0	149	302	49	157	1.9	219	35	102	74	4.49	2.91	12.7	#NULL!	1	1	1	5	1	0.5	0.5	0.5	0	2	5
2	2		1		0	0	0.30	1	0	142	84	0	190	226	27	146	1.2	103	48	84	62	3.04	1.75	14.3	#NULL!	5	0	0	3	1	1.1	1.0	0.6	0	3	3
2	2		1		0	0	0.30	1	0	142	84	0	190	226	27	146	1.2	103	48	84	62	3.04	1.75	14.3	#NULL!	1	0	0	0	1	0.8	0.6	0.6	0	3	0
2	2		0		0	0	0.30	1	0	132	86	0	108	244	33	171	1.0	230	41	90	40	4.17	2.20	6.4	#NULL!	2	2	1	6	1	0.8	0.8	0.5	0	3	6
2	1	Endoph	0		0	0	#NULL!	#NULL!	#NULL!	132	86	0	108	244	33	171	1.0	230	41	90	40	4.17	2.20	6.4	#NULL!	#NULL!	#NULL!	#NULL!	#NULL!	1	#NULL!	#NULL!	#NULL!	#NULL!	#NULL!	6
2	2		0	PSC	0	0	0.30	1	0	120	80	0	158	326	19	206	0.9	122	39	107	87	5.28	2.74	12.5	#NULL!	2	2	1	6	1	0.3	0.5	0.5	0	1	6
2	2		0	PSC	0	0	0.30	1	0	120	80	0	158	326	19	206	0.9	122	39	107	87	5.28	2.74	12.5	#NULL!	2	3	1	6	1	0.3	0.3	0.3	0	2	6
2	2		0	IMC	0	0	0.40	4	0	116	74	0	141	182	32	146	1.6	94	45	84	57	3.24	1.87	12.0	#NULL!	2	3	1	0	0	#NULL!	#NULL!	#NULL!	#NULL!	#NULL!	0
2	2		0	IMC	0	0	0.40	4	0	116	74	0	141	182	32	146	1.6	94	45	84	57	3.24	1.87	12.0	#NULL!	2	3	1	0	0	#NULL!	#NULL!	#NULL!	#NULL!	#NULL!	0
2	2		0	IMC	0	0	0.30	4	0	108	76	0	272	379	24	167	1.3	128	42	94	69	3.98	2.24	11.6	#NULL!	0	0	0	0	1	0.3	0.3	0.3	0	2	0
2	2		1		0	0	0.30	4	0	108	76	0	272	379	24	167	1.3	128	42	94	69	3.98	2.24	11.6	#NULL!	1	0	0	1	1	0.3	0.0	0.0	0	3	1
2	2		1		0	0	0.30	1	0	138	76	0	88	116	24	156	1.1	94	49	102	65	3.18	2.08	8.4	#NULL!	0	0	0	0	1	0.2	0.2	0.2	0	2	0
2	2		1		0	0	0.30	1	0	138	76	0	88	116	24	156	1.1	94	49	102	65	3.18	2.08	8.4	#NULL!	0	0	0	0	1	0.6	0.6	0.6	0	3	0
2	2		1		0	0	0.30	1	0	124	68	0	142	292	30	187	0.9	117	50	86	79	3.74	1.72	12.2	#NULL!	1	0	0	0	1	1.1	1.1	1.1	0	2	0
2	2		1		0	0	0.30	1	0	124	68	0	142	292	30	187	0.9	117	50	86	79	3.74	1.72	12.2	#NULL!	1	0	0	0	1	1.2	1.2	1.2	0	2	0
2	2		1		0	0	0.30	1	0	118	64	0	116	248	21	154	1.5	103	37	85	49	4.16	2.30	12.2	#NULL!	2	1	1	5	1	0.5	0.5	0.5	0	1	5
2	2		1		0	0	0.30	1	0	118	64	0	116	248	21	154	1.5	103	37	85	49	4.16	2.30	12.2	#NULL!	2	1	1	5	1	0.6	0.6	0.6	0	1	5
2	2		0	IMC	0	0	0.40	3	0	100	70	1	66	222	57	#NULL!	2.8	#NULL!	#NULL!	#NULL!	#NULL!	#NULL!	#NULL!	10.2	#NULL!	7	2	1	8	0	#NULL!	#NULL!	#NULL!	#NULL!	#NULL!	8
2	2		0	IMC	0	0	0.40	3	0	100	70	1	66	222	57	#NULL!	2.8	#NULL!	#NULL!	#NULL!	#NULL!	#NULL!	#NULL!	10.2	#NULL!	7	2	1	8	0	#NULL!	#NULL!	#NULL!	#NULL!	#NULL!	8
2	2		0	IMC	0	0	0.30	4	0	118	84	0	119	211	21	122	0.9	249	39	93	31	3.13	2.38	13.6	#NULL!	3	2	1	9	1	1.0	0.6	0.5	0	3	#NULL!
2	2		0	IMC	0	0	0.30	4	0	118	84	0	119	211	21	122	0.9	249	39	93	31	3.13	2.38	13.6	#NULL!	3	2	1	9	1	0.5	0.3	0.3	0	3	#NULL!
2	2		0	IMC	0	0	0.30	1	0	140	92	0	132	233	21	135	0.8	149	44	95	38	3.07	2.16	12.2	#NULL!	1	2	1	7	1	0.6	0.3	0.3	0	3	7
2	2		1		0	0	0.30	1	0	140	92	0	132	233	21	135	0.8	149	44	95	38	3.07	2.16	12.2	#NULL!	5	2	1	7	1	0.3	0.3	0.0	0	3	7
2	2		1		0	0	0.40	4	0	100	74	0	120	244	23	145	0.9	97	43	100	67	3.37	2.33	11.2	#NULL!	5	2	1	7	1	1.0	1.0	1.0	0	3	7
2	2		1		0	0	0.40	4	0	100	74	0	120	244	23	145	0.9	97	43	100	67	3.37	2.33	11.2	#NULL!	5	2	1	7	1	0.6	0.6	0.6	0	3	7
2	2		1		0	0	0.30	1	0	94	72	0	143	311	25	233	1.1	142	33	105	62	7.06	3.18	9.4	#NULL!	2	1	1	7	1	0.3	0.3	0.0	0	3	7
2	2		1		0	0	0.30	1	0	94	72	0	143	311	25	233	1.1	142	33	105	62	7.06	3.18	9.4	#NULL!	2	1	1	7	1	0.2	0.2	0.2	0	2	7
2	2		1		0	0	0.30	1	0	100	68	0	110	180	24	154	0.8	163	41	97	37	3.76	2.37	11.6	#NULL!	2	0	0	6	1	0.5	0.5	0.5	1	2	6
2	2		1		0	0	0.30	1	0	100	68	0	110	180	24	154	0.8	163	41	97	37	3.76	2.37	11.6	#NULL!	2	0	0	6	1	1.1	1.1	1.1	1	1	6
2	2		0		0	0	0.30	4	0	108	74	0	116	321	22	181	0.9	122	52	98	69	3.48	1.88	10.8	#NULL!	6	4	1	7	1	1.1	1.1	0.8	0	3	7
2	2		0		0	0	0.30	4	2	108	74	0	116	321	22	181	0.9	122	52	98	69	3.48	1.88	10.8	#NULL!	7	3	1	8	1	1.0	1.0	1.0	0	3	8
2	2		1		0	0	0.30	1	0	124	82	0	143	206	24	164	1.3	174	40	99	35	4.10	2.48	10.2	#NULL!	1	0	0	0	1	0.0	0.0	0.0	0	3	0
2	2		1		0	0	0.30	1	0	124	82	0	143	206	24	164	1.3	174	40	99	35	4.10	2.48	10.2	#NULL!	2	1	1	1	1	0.0	0.0	0.0	0	3	1
2	2		1		0	0	0.40	1	0	134	86	0	123	243	22	183	1.1	84	38	91	65	4.82	2.39	9.4	#NULL!	1	0	0	1	1	0.2	0.0	0.0	0	3	1
2	2		1		0	0	0.40	1	0	134	86	0	123	243	22	183	1.1	84	38	91	65	4.82	2.39	9.4	#NULL!	1	0	0	0	1	0.0	0.0	0.0	0	2	0
2	2		0	IMC	1	0	0.30	4	0	124	80	0	155	250	34	163	1.2	102	32	90	76	5.09	2.81	8.4	#NULL!	3	2	1	6	1	0.3	0.3	0.2	0	3	6
2	2		0	IMC	1	0	0.30	4	0	124	80	0	155	250	34	163	1.2	102	32	90	76	5.09	2.81	8.4	#NULL!	3	2	1	6	1	0.8	0.6	0.6	0	3	6
2	2		0		0	0	0.30	1	0	128	86	0	104	176	27	176	1.3	91	28	85	55	6.29	3.04	8.4	#NULL!	2	0	0	1	1	0.3	0.3	0.3	0	2	1
2	2		0		1	0	0.30	1	0	128	86	0	104	176	27	176	1.3	91	28	85	55	6.29	3.04	8.4	#NULL!	2	0	0	1	1	0.5	0.5	0.3	0	2	1
2	2		0	PSC	0	0	0.30	1	0	140	88	0	282	370	22	145	1.1	72	51	75	55	2.84	1.47	13.2	#NULL!	2	1	1	5	1	0.6	0.6	0.6	0	3	5
2	2		0	PSC	1	0	0.30	1	0	140	88	0	282	370	22	145	1.1	72	51	75	55	2.84	1.47	13.2	#NULL!	2	1	1	5	1	0.5	0.5	0.5	0	3	5
1	2		1		0	0	0.90	3	0	134	76	0	110	162	34	178	2.1	86	47	89	71	3.79	1.89	12.0	#NULL!	2	2	1	6	1	3.0	3.0	3.0	0	2	6
2	2		0		0	0	0.30	4	0	134	76	0	110	162	34	178	2.1	86	47	89	17	3.79	1.89	12.0	#NULL!	5	2	1	6	1	0.6	0.6	0.6	0	3	6
2	2		0	IMC	0	0	0.30	4	0	120	70	0	304	358	41	246	1.8	132	38	106	85	6.47	2.79	11.3	#NULL!	6	2	1	7	1	1.1	0.8	0.8	0	3	7
2	2		0	IMC	0	0	0.30	4	0	120	70	0	304	358	41	246	1.8	132	38	106	85	6.47	2.79	11.3	#NULL!	6	2	1	7	1	1.3	1.1	1.0	0	3	7
2	2		1		0	0	0.30	4	0	116	80	0	75	165	23	182	1.0	186	50	95	37	3.64	1.90	15.0	11.00	3	2	1	3	1	0.3	0.2	0.2	0	3	3
2	2		1		0	0	0.30	4	0	116	80	0	75	165	23	182	1.0	186	50	95	37	3.64	1.90	15.0	11.00	3	2	1	0	1	0.2	0.2	0.2	0	2	0
1	2		0	MC	1	0	0.30	4	0	124	82	0	160	262	41	143	1.2	90	47	106	56	3.04	2.26	11.2	#NULL!	4	0	0	0	1	3.0	3.0	3.0	0	2	#NULL!
2	2		1		0	1	0.30	4	0	124	82	0	160	262	41	143	1.2	90	47	106	56	3.04	2.26	11.2	#NULL!	7	0	0	8	1	2.0	2.0	2.0	0	2	8
2	2		1		0	0	0.30	4	0	106	80	0	121	294	25	145	1.4	122	39	79	60	3.72	2.03	10.2	#NULL!	3	2	1	7	1	0.8	0.8	0.8	0	3	7
2	2		1		0	0	0.30	4	0	106	80	0	121	294	25	145	1.4	122	39	79	60	3.72	2.03	10.2	#NULL!	5	2	1	9	1	0.8	0.6	0.6	0	3	#NULL!
2	2		1		0	1	0.30	1	0	100	64	0	75	228	24	250	0.8	65	42	84	54	5.95	2.00	9.4	8.60	7	0	0	9	1	0.2	0.2	0.2	0	3	9
2	2		1		0	0	0.30	1	0	100	64	0	75	228	24	250	0.8	65	42	84	54	5.95	2.00	9.4	8.60	3	0	0	8	1	0.2	0.2	0.2	0	3	8
2	2		1		0	0	0.30	1	2	126	78	0	68	146	20	140	0.9	98	35	102	48	4.00	2.91	12.6	9.00	5	2	1	7	1	0.2	0.2	0.2	0	3	7
2	2		1		0	0	0.30	1	2	126	78	0	68	146	20	140	0.9	98	35	102	48	4.00	2.91	12.6	9.00	7	0	0	9	1	1.3	3.0	3.0	0	1	#NULL!
2	2		1		0	0	0.30	4	0	108	74	0	134	279	21	222	1.0	76	51	89	73	4.35	1.75	13.0	#NULL!	6	0	0	7	1	0.5	0.5	0.5	0	1	7
2	2		1		0	0	0.30	4	0	108	74	0	134	279	21	222	1.0	76	51	89	73	4.35	1.75	13.0	#NULL!	6	0	0	9	1	0.5	0.0	0.0	0	3	9
2	2		1		0	0	0.30	4	0	130	88	0	130	138	21	149	0.8	81	52	81	16	2.87	1.56	15.0	9.00	3	2	1	7	1	0.2	0.2	0.2	0	1	7
2	2		0	VH	0	1	0.30	1	0	130	88	0	130	138	21	149	0.8	81	52	81	16	2.87	1.56	15.0	9.00	7	0	0	9	1	3.0	1.3	1.2	0	3	9
1	2		0	VH	0	1	0.30	1	2	130	80	0	185	264	22	152	0.9	65	65	84	13	2.34	1.29	15.4	8.30	7	0	0	9	1	1.1	1.1	0.3	0	3	9
2	2		0	IMC	0	0	0.30	1	2	130	80	0	185	264	22	152	0.9	65	65	84	13	2.34	1.29	15.4	8.30	2	0	0	0	1	0.0	0.0	0.0	0	2	0
2	2		0	VH	0	1	0.30	1	0	140	90	0	197	303	26	145	1.4	70	55	76	14	2.64	1.38	16.0	8.40	7	0	0	9	1	1.1	1.0	1.1	0	1	#NULL!
2	2		1		0	0	0.30	1	0	140	90	0	197	303	26	145	1.4	70	55	76	14	2.64	1.38	16.0	8.40	7	2	1	3	1	0.3	0.3	0.3	0	1	3
2	2		1		0	0	0.30	1	0	160	80	1	76	164	49	234	1.3	156	34	154	46	6.88	4.53	11.0	7.60	6	1	1	9	1	1.1	1.1	1.1	0	1	9

Glaucoma	Anteriorvitreous	Remarks	Media	Reason	cat_sx	VH	CD_ratio	AV_ratio	HTR	BP_Systolic	BP_Diastolic	Albuminuria1	FBS	PPBS	Urea	Serum_cholestero	Creatinine	TGL	HDL	LDL	VLDL	TC_HDL ratio	LDLHDLratio	Hb	HbA1C	DR_stage	Maculopathy	Maculopathy1	Treatment1	Followup	Vision_1	Vision_2	Vision_3	dev_mac_edema	visualoutcome	Rx
2	2		1		0	0	0.30	1	0	160	80	1	76	164	49	234	1.3	156	34	154	46	6.88	4.53	11.0	7.60	2	1	1	3	1	0.6	0.6	0.6	0	1	3
2	2		1		0	0	0.30	1	0	158	84	0	153	234	21	159	1.2	101	49	97	43	3.24	1.98	11.7	#NULL!	3	2	1	3	1	0.3	0.3	0.3	0	2	3
2	2		1		0	0	0.30	1	0	158	84	0	153	234	21	159	1.2	101	49	97	43	3.24	1.98	11.7	#NULL!	3	2	1	3	1	0.2	0.2	0.2	0	2	3
2	2		1		0	0	0.40	1	2	138	74	0	360	512	41	260	1.0	140	65	167	28	4.00	2.57	12.4	13.80	6	2	1	9	1	0.8	0.8	0.8	0	2	9
2	2		1		0	0	0.40	1	2	138	74	0	360	512	41	260	1.0	140	65	167	28	4.00	2.57	12.4	13.80	6	2	1	9	1	0.2	0.2	0.2	0	3	9
2	2		0	VH	0	1	0.30	4	2	124	76	1	95	260	37	162	0.9	84	50	78	45	3.24	1.56	12.4	7.90	7	0	0	9	1	1.0	0.6	0.6	0	3	9
2	2		1		0	0	0.30	1	2	124	76	1	95	260	37	162	0.9	84	50	78	45	3.24	1.56	12.4	7.90	3	2	1	9	1	0.8	0.5	0.5	0	3	9
2	2		0	cataract	0	0	0.30	1	0	140	90	0	154	209	24	194	0.9	80	39	93	74	4.97	2.38	11.2	#NULL!	2	0	0	0	1	1.0	1.0	1.0	1	2	0
2	2		#NULL!		0	0	0.30	1	0	140	90	0	154	209	24	194	0.9	80	39	93	74	4.97	2.38	11.2	#NULL!	2	2	1	3	1	0.0	0.0	0.0	0	3	3
2	2		0	cataract	0	0	0.30	2	1	130	90	1	343	284	32	145	0.8	191	50	57	38	2.90	1.14	11.5	11.10	3	4	1	3	1	0.5	0.5	0.5	0	2	3
2	2		0	cataract	0	0	0.30	2	1	130	90	1	343	284	32	145	0.8	191	50	57	38	2.90	1.14	11.5	11.10	3	4	1	3	1	0.5	0.5	0.5	0	2	3
2	2		0	cataract	0	0	0.30	3	2	150	90	1	202	309	47	188	1.2	242	42	98	48	4.48	2.33	10.7	10.00	3	0	0	5	1	0.8	0.0	0.0	1	3	5
2	2		0	cataract	0	0	0.30	3	2	150	90	1	202	309	47	188	1.2	242	42	98	48	4.48	2.33	10.7	10.00	3	1	1	2	1	0.8	0.3	0.3	0	3	2
2	2		0	cataract	0	0	0.30	1	0	140	84	0	104	224	24	149	1.3	184	40	56	50	3.73	1.40	9.4	#NULL!	2	2	1	5	1	0.2	0.2	0.2	0	2	5
2	2		0	cataract	0	0	0.30	1	0	140	84	0	104	224	24	149	1.3	184	40	56	50	3.73	1.40	9.4	#NULL!	2	2	1	5	1	0.2	0.2	0.2	0	3	5
2	2		0	cataract	0	0	0.30	1	1	150	90	0	76	95	33	235	1.2	79	50	169	16	4.70	3.38	14.7	6.40	2	2	1	9	1	0.3	0.5	0.5	0	1	9
2	2		1		0	0	0.30	1	1	150	90	0	76	95	33	235	1.2	79	50	169	16	4.70	3.38	14.7	6.40	2	2	1	9	1	1.0	0.5	0.3	0	3	9
2	2		1		0	0	0.30	2	1	140	70	0	138	278	41	194	1.0	146	43	122	29	4.51	2.84	13.8	11.00	2	2	1	6	1	0.2	0.2	0.2	0	1	6
2	2		1		0	0	0.30	2	1	140	70	0	138	278	41	194	1.0	146	43	122	29	4.51	2.84	13.8	11.00	5	2	1	7	1	0.5	0.5	0.5	0	2	7
2	2		1		0	0	0.30	2	1	150	90	0	102	222	22	265	0.9	138	44	190	30	6.02	4.32	13.2	8.10	5	4	1	7	1	0.2	0.2	0.0	0	3	7
2	2		1		0	0	0.30	3	1	150	90	0	102	222	22	265	0.9	138	44	190	30	6.02	4.32	13.2	8.10	3	4	1	7	1	0.5	0.3	0.3	0	3	7
2	2		1		0	0	0.40	2	2	140	90	0	110	240	16	142	1.2	152	48	90	48	2.96	1.88	11.4	7.10	6	2	1	7	1	0.8	0.8	0.8	0	1	7
2	2		1		0	0	0.40	2	2	140	90	0	110	240	16	142	1.2	152	48	90	48	2.96	1.88	11.4	7.10	6	2	1	7	1	1.0	0.8	0.8	0	1	7
2	2		0	cataract	0	0	0.30	1	0	140	90	0	68	189	24	182	1.1	140	40	106	22	4.55	2.65	10.4	8.20	5	2	1	9	1	0.2	0.2	0.2	0	2	9
2	2		0	cataract	0	0	0.30	1	0	140	90	0	68	189	24	182	1.1	140	40	106	22	4.55	2.65	10.4	8.20	5	2	1	9	1	0.6	0.6	0.6	0	1	9
2	2		0	cataract	0	0	0.30	4	0	140	80	0	120	246	17	154	0.8	75	55	84	15	2.80	1.53	12.4	10.00	5	0	0	7	1	1.0	1.0	1.0	0	2	7
2	2		0	vh	0	1	0.30	4	0	140	80	0	120	246	17	154	0.8	75	55	84	15	2.80	1.53	12.4	10.00	5	0	0	7	1	3.0	3.0	3.0	0	1	7
2	2		1		0	0	0.30	4	0	130	74	0	163	188	25	160	1.6	184	48	79	20	3.33	1.65	12.1	10.70	5	2	1	7	1	1.1	0.5	0.5	0	1	7
2	2		1		0	0	0.30	4	0	130	74	0	163	188	25	160	1.6	184	48	79	20	3.33	1.65	12.1	10.70	5	2	1	7	1	0.0	0.3	0.3	0	1	7
2	2		0	cataract	0	0	0.30	3	2	150	84	0	64	154	22	149	1.0	134	42	64	35	3.55	1.52	12.2	5.50	1	1	1	1	1	0.6	0.6	0.6	0	1	1
2	2		0	cataract	0	0	0.30	3	2	150	84	0	64	154	22	149	1.0	134	42	64	35	3.55	1.52	12.2	5.50	1	0	0	0	1	0.3	0.3	0.3	0	1	0
2	2		1		0	0	0.30	1	0	130	70	0	106	164	36	189	1.2	122	45	92	34	4.20	2.04	10.2	5.60	2	1	1	5	1	0.0	0.0	0.0	0	3	5
2	2		1		0	0	0.30	1	0	130	70	0	106	164	36	189	1.2	122	45	92	34	4.20	2.04	10.2	5.60	2	0	0	0	1	0.0	0.0	0.0	0	2	0
2	2		1		0	0	0.40	1	0	134	90	1	209	259	23	199	1.1	145	39	131	29	5.10	3.36	13.6	9.30	2	2	1	6	1	0.2	0.2	0.2	0	3	6
2	2		0	IMC	0	0	0.40	1	0	134	90	1	209	259	23	199	1.1	145	39	131	29	5.10	3.36	13.6	#NULL!	2	2	1	6	1	0.6	0.6	0.6	0	3	6
2	2		1		0	0	0.30	1	0	128	66	0	147	202	27	173	1.0	146	45	142	23	3.84	3.16	10.2	5.90	2	2	1	6	1	0.2	0.2	0.2	0	2	6
2	2		1		0	0	0.30	1	0	128	66	0	147	202	27	173	1.0	146	45	142	23	3.84	3.16	10.2	5.90	3	2	1	6	1	0.5	0.5	0.5	0	3	6
2	2		0	asteroid	0	0	0.30	1	0	100	70	1	201	366	29	240	0.8	150	24	124	26	10.00	5.17	8.4	10.10	6	0	0	7	1	0.6	0.6	0.6	0	3	7
2	2		0	asteroid	0	0	0.30	1	0	100	70	1	201	366	29	240	0.8	150	24	124	26	10.00	5.17	8.4	10.10	6	0	0	7	1	0.2	0.2	0.2	0	2	7
2	2		1		0	0	0.40	4	0	116	82	0	103	185	33	194	1.1	59	62	105	11	3.13	1.69	10.2	10.20	4	2	1	9	1	0.0	0.0	0.0	0	2	9
2	2		1		0	0	0.40	4	0	116	82	0	103	185	33	194	1.1	59	62	105	11	3.13	1.69	10.2	10.20	4	2	1	9	1	0.3	0.3	0.3	0	3	9
2	2		0	VH	0	1	0.30	1	0	124	96	0	122	186	35	156	1.4	67	39	94	23	4.00	2.41	11.6	#NULL!	5	0	0	7	1	0.6	0.6	0.6	0	2	7
2	2		1		0	0	0.30	1	0	124	96	0	122	186	35	156	1.4	67	39	94	23	4.00	2.41	11.6	#NULL!	5	0	0	7	1	0.3	3.0	0.3	0	2	7
2	2		1		0	0	0.30	1	0	118	84	0	201	276	21	178	1.0	55	26	87	31	6.85	3.35	12.2	#NULL!	5	2	1	6	1	0.3	0.3	0.3	0	1	6
2	2		1		0	0	0.30	1	0	118	84	0	201	276	21	178	1.0	55	26	87	31	6.85	3.35	12.2	#NULL!	5	2	1	6	1	0.5	0.5	0.5	0	1	6
2	2		1		0	0	0.40	1	0	124	88	0	164	234	24	184	1.3	152	24	92	42	7.67	3.83	11.2	8.70	5	1	1	7	1	0.6	0.6	0.6	0	1	7
2	2		1		0	0	0.40	1	0	124	88	0	164	234	24	184	1.3	152	24	92	42	7.67	3.83	11.2	8.70	5	1	1	7	1	0.5	0.5	0.5	0	1	7
2	2		1		0	0	0.30	1	2	148	94	1	298	332	55	184	1.5	275	42	87	55	4.38	2.07	13.0	7.80	5	0	0	0	1	0.2	0.2	0.2	0	2	0
2	2		1		0	0	0.30	1	2	148	94	1	298	332	55	184	1.5	275	42	87	55	4.38	2.07	13.0	7.80	5	0	0	0	1	0.6	0.6	0.6	0	2	0
2	2		1		0	0	0.30	1	0	130	92	0	115	287	33	192	0.8	172	36	124	64	5.33	3.44	11.6	7.10	2	1	1	3	1	0.5	0.5	0.5	0	2	3
2	2		1		0	0	0.30	1	0	130	92	0	115	287	33	192	0.8	172	36	124	64	5.33	3.44	11.6	7.10	2	1	1	3	1	0.0	0.0	0.0	0	2	3
1	2		0	IMC	0	0	0.60	3	1	142	88	0	118	187	26	198	1.2	176	27	111	52	7.33	4.11	10.2	#NULL!	2	1	1	5	1	0.3	0.3	0.3	0	1	5
1	2		0	IMC	0	0	0.60	3	1	142	88	0	118	187	26	198	1.2	176	27	111	52	7.33	4.11	10.2	#NULL!	1	1	1	5	1	0.2	0.2	0.2	0	1	5
2	2		0	IMC	0	0	0.40	1	0	124	76	0	114	230	24	223	1.5	89	40	100	65	5.58	2.50	11.9	8.90	5	0	0	9	1	0.3	0.3	0.3	0	3	9
2	2		0	IMC	0	0	0.40	1	0	124	76	0	114	230	24	223	1.5	89	40	100	65	5.58	2.50	11.9	8.90	3	0	0	7	1	0.2	0.2	0.2	1	3	7
2	2		1		0	0	0.40	1	0	116	70	0	143	208	24	187	1.0	59	37	97	74	5.05	2.62	12.2	#NULL!	3	2	1	6	1	0.0	0.0	0.0	0	3	6
2	2		0	IMC	1	0	0.40	1	0	116	70	0	143	208	24	187	1.0	59	37	97	74	5.05	2.62	12.2	#NULL!	3	2	1	6	1	0.0	0.0	0.0	0	3	6
2	2		0	IMC	0	0	0.30	4	0	100	72	0	122	348	17	140	0.8	90	55	67	18	2.55	1.22	12.5	7.40	6	0	0	7	1	1.0	1.1	1.1	0	1	7
2	2		0	IMC	0	0	0.30	2	0	100	72	0	122	348	17	140	0.8	90	55	67	18	2.55	1.22	12.5	7.40	6	0	0	9	1	1.1	3.0	3.0	0	1	9
1	2	NVG	1		0	0	0.60	2	0	150	84	0	154	326	25	210	0.9	94	38	64	18	5.53	1.68	11.2	10.40	2	0	0	0	1	0.2	0.2	0.2	0	2	0
2	2		0	VH	0	1	0.60	4	0	150	84	0	154	326	25	210	0.9	94	38	64	18	5.53	1.68	11.2	10.40	6	0	0	0	1	3.0	1.3	1.0	0	3	0
2	2		0	VH	0	1	0.40	4	1	164	94	0	125	226	21	187	1.2	89	42	98	47	4.45	2.33	12.8	#NULL!	6	0	0	7	1	2.0	1.2	1.0	0	3	7
2	2		1		0	0	0.80	4	0	164	94	0	125	226	21	187	1.2	89	42	98	47	4.45	2.33	12.8	#NULL!	3	0	0	0	1	1.0	1.0	1.0	0	2	0
2	2		0	IMC	0	0	0.40	1	1	144	88	0	112	256	25	194	1.1	77	24	100	54	8.08	4.17	11.5	#NULL!	2	1	1	5	1	0.6	0.6	0.6	0	2	5
2	2		0	IMC	0	0	0.40	1	1	144	88	0	112	256	25	194	1.1	77	24	100	54	8.08	4.17	11.5	#NULL!	2	1	1	5	1	0.5	0.5	0.5	0	2	5
2	2		0	IMC	0	0	0.40	1	0	142	80	0	176	308	26	187	1.4	146	45	126	30	4.16	2.80	11.2	#NULL!	2	1	1	5	1	0.5	0.5	0.5	0	2	5
2	2		0	IMC	0	0	0.40	1	0	142	80	0	176	308	26	187	1.4	146	45	126	30	4.16	2.80	11.2	#NULL!	2	2	1	6	1	0.5	0.5	0.5	0	2	6
2	2		0	PSC	1	0	0.30	1	0	130	86	0	148	208	23	211	1.3	150	42	100	28	5.02	2.38	14.3	#NULL!	1	2	1	0	1	0.0	0.0	0.0	0	2	#NULL!
2	2		1		0	0	0.30	1	0	130	86	0	148	208	23	211	1.3	150	42	100	28	5.02	2.38	14.3	#NULL!	1	2	1	0	1	0.0	0.0	0.0	0	2	#NULL!
1	2	PACS	0	PSC	0	0	0.30	1	0	112	88	0	322	475	27	248	1.0	164	28	112	35	8.86	4.00	14.7	#NULL!	1	0	0	0	1	0.2	0.2	0.2	0	2	0
1	2	PACS	0	PSC	1	0	0.30	1	0	112	88	0	322	475	27	248	1.0	164	28	112	35	8.86	4.00	14.7	#NULL!	1	0	0	0	1	0.0	0.0	0.0	0	2	0

Glaucoma	Anteriorvitreous	Remarks	Media	Reason	cat_sx	VH	CD_ratio	AV_ratio	HTR	BP_Systolic	BP_Diastolic	Albuminuria1	FBS	PPBS	Urea	Serum_cholestero	Creatinine	TGL	HDL	LDL	VLDL	TC_HDL ratio	LDLHDLratio	Hb	HbA1C	DR_stage	Maculopathy	Maculopathy1	Treatment1	Followup	Vision_1	Vision_2	Vision_3	dev_mac_edema	visualoutcome	Rx
1	2	PACS	0	PSC	0	0	0.40	3	1	148	72	0	250	325	24	174	1.1	146	37	106	38	4.70	2.86	14.6	#NULL!	1	0	0	0	1	0.2	0.2	0.2	0	2	0
1	2	PACS	0	PSC	1	0	0.40	3	1	148	72	0	250	325	24	174	1.1	146	37	106	38	4.70	2.86	14.6	#NULL!	2	1	1	5	1	0.0	0.0	0.0	0	3	5
2	2		1		0	0	0.30	1	0	100	70	0	182	247	26	246	1.1	168	44	97	46	5.59	2.20	12.2	#NULL!	2	0	0	1	1	0.0	0.0	0.0	1	2	1
2	2		1		0	0	0.30	1	0	100	70	0	182	247	26	246	1.1	168	44	97	46	5.59	2.20	12.2	#NULL!	2	0	0	0	1	0.0	0.0	0.0	0	2	0
2	2		0	IMC	0	0	0.30	4	0	134	88	0	352	228	30	194	1.0	176	41	97	42	4.20	2.31	9.1	#NULL!	6	0	0	7	1	0.8	0.8	0.8	0	3	#NULL!
2	2		0	IMC	0	0	0.30	4	0	134	88	0	352	228	30	194	1.0	176	41	97	42	4.20	2.31	9.1	#NULL!	3	0	0	0	1	1.0	1.0	1.0	0	2	#NULL!
2	2		0	PSC	0	0	0.30	1	0	144	96	0	171	225	27	237	1.2	184	26	124	54	9.12	4.77	12.8	#NULL!	2	2	1	6	1	0.8	0.6	0.6	0	3	6
2	2		0	PSC	0	0	0.30	1	0	144	96	0	171	225	27	237	1.2	184	26	124	54	9.12	4.77	12.8	#NULL!	2	2	1	6	1	0.6	0.6	0.6	0	3	6
2	2		0	IMC	0	0	0.30	1	0	126	74	0	196	240	31	295	1.4	380	50	179	76	5.90	3.58	13.0	#NULL!	2	1	1	1	1	0.5	0.2	0.2	0	3	1
2	2		0	IMC	0	0	0.30	1	0	126	74	0	196	240	31	295	1.4	380	50	179	76	5.90	3.58	13.0	#NULL!	5	1	1	7	1	0.5	0.2	0.2	0	3	7
2	1	VH	0	VH	0	1	0.30	4	0	142	84	0	305	584	20	216	1.2	167	34	102	78	6.35	3.00	9.0	#NULL!	6	0	0	7	1	1.1	1.0	0.8	0	3	7
2	2		0	IMC	0	0	0.30	1	0	142	84	0	305	584	20	216	1.2	167	34	102	78	6.35	3.00	9.0	#NULL!	3	3	1	5	1	0.8	0.8	0.8	0	3	5
2	2		1		0	0	0.30	4	0	128	86	0	144	289	29	186	1.5	124	42	97	60	4.43	2.31	12.1	#NULL!	5	2	1	9	1	0.2	0.2	0.2	0	2	9
2	2		1		0	0	0.30	4	0	128	86	0	144	289	29	186	1.5	124	42	97	60	4.43	2.31	12.1	#NULL!	5	2	1	9	1	0.6	0.6	0.6	0	1	9
2	2		0	IMC	0	0	0.30	1	0	130	84	0	105	230	27	239	0.9	144	42	109	65	5.69	2.60	11.9	#NULL!	1	1	1	5	1	1.0	1.0	0.8	0	3	5
1	2		0	IMC, NVG	0	0	0.30	1	0	130	84	0	105	230	27	239	0.9	144	42	109	65	5.69	2.60	11.9	#NULL!	1	1	1	5	1	1.1	1.1	1.2	0	1	5
2	2		0	IMC	0	0	0.30	1	0	136	88	0	167	289	31	176	0.8	134	37	96	64	4.76	2.59	10.8	#NULL!	2	2	1	6	1	0.3	0.6	0.5	0	1	6
2	2		0	IMC	0	0	0.30	1	0	136	88	0	167	289	31	176	0.8	134	37	96	64	4.76	2.59	10.8	#NULL!	2	2	1	6	1	0.2	0.2	0.2	0	2	6
2	2		1		0	0	0.30	1	0	150	80	0	230	346	28	208	0.9	151	41	118	57	5.07	2.88	13.9	#NULL!	1	1	1	5	1	0.2	0.2	0.2	0	1	5
2	2		1		0	0	0.30	1	0	150	80	0	230	346	28	208	0.9	151	41	118	57	5.07	2.88	13.9	#NULL!	3	0	0	0	1	0.0	0.0	0.0	0	2	0
2	2		1		0	0	0.30	1	1	138	96	0	162	247	22	209	1.0	147	39	106	72	5.36	2.72	8.4	#NULL!	2	2	1	6	1	0.6	0.6	0.6	0	3	6
2	2		1		0	0	0.30	1	1	138	96	0	162	247	22	209	1.0	147	39	106	72	5.36	2.72	8.4	#NULL!	2	2	1	6	1	0.2	0.2	0.2	0	2	6
2	2		1		0	0	0.40	1	0	140	82	0	149	298	28	187	0.8	109	50	98	65	3.74	1.96	12.9	#NULL!	1	1	1	5	1	0.2	0.0	0.0	0	3	5
2	2		1		0	0	0.40	1	0	140	82	0	149	298	28	187	0.8	109	50	98	65	3.74	1.96	12.9	#NULL!	1	2	1	0	1	0.0	0.0	0.0	0	2	0
2	2		1		0	0	0.30	4	2	160	90	0	158	247	24	247	1.0	97	41	101	62	6.02	2.46	10.6	#NULL!	0	0	0	0	1	0.0	0.0	0.0	0	2	0
2	2		1		0	0	0.30	4	2	160	90	0	158	247	24	247	1.0	97	41	101	62	6.02	2.46	10.6	#NULL!	0	0	0	1	1	0.0	0.0	0.0	0	2	1
2	2		1		0	0	0.40	4	0	126	74	0	101	189	98	184	6.2	102	49	84	84	3.76	1.71	14.6	#NULL!	3	0	0	0	1	0.0	0.0	0.0	0	2	0
2	2		1		0	0	0.40	4	0	126	74	0	101	189	98	184	6.2	102	49	84	84	3.76	1.71	14.6	#NULL!	5	0	0	3	1	0.3	0.3	0.2	0	3	3
2	2		0	IMC	0	0	0.30	1	0	124	88	0	89	183	24	145	1.0	88	35	67	32	4.14	1.91	11.1	#NULL!	3	2	1	6	1	0.8	0.6	0.6	0	3	6
2	2		0	IMC	0	0	0.30	1	0	124	88	0	89	183	24	145	1.0	88	35	67	32	4.14	1.91	11.1	#NULL!	3	2	1	6	1	0.6	0.6	0.5	0	3	6
2	2		1		0	0	0.40	1	0	142	76	0	94	197	33	168	1.2	102	52	87	64	3.23	1.67	12.8	#NULL!	2	1	1	5	1	0.3	0.3	0.3	0	2	5
2	2		1		0	0	0.40	1	0	142	76	0	94	197	33	168	1.2	102	52	87	64	3.23	1.67	12.8	#NULL!	2	1	1	5	1	0.6	0.6	0.6	0	2	5
2	2		0	VH	0	1	0.30	4	0	140	86	0	167	289	24	179	1.1	111	47	93	56	3.81	1.98	11.7	#NULL!	6	0	0	7	1	1.1	1.0	0.8	0	3	7
2	2		0	IMC	0	0	0.30	1	0	140	86	0	167	289	24	179	1.1	111	47	93	56	3.81	1.98	11.7	#NULL!	5	0	0	7	1	0.2	0.2	0.2	0	2	7
2	2		0	IMC	0	0	0.30	4	0	128	72	0	94	287	26	199	0.9	98	42	104	67	4.74	2.48	12.2	#NULL!	5	0	0	7	1	0.5	0.5	0.8	0	1	7
2	2		0	IMC	1	0	0.30	4	0	128	72	0	94	287	26	199	0.9	98	42	104	67	4.74	2.48	12.2	#NULL!	5	0	0	7	1	0.8	0.5	0.5	0	3	7
2	2		1		0	0	0.30	4	0	144	70	0	178	347	29	242	1.2	109	49	120	72	4.94	2.45	11.6	#NULL!	5	0	0	7	1	0.5	0.5	0.5	0	3	7
2	1		0	VH	0	1	0.40	4	0	144	70	0	178	347	29	242	1.2	109	49	120	72	4.94	2.45	11.6	#NULL!	6	0	0	7	1	1.1	0.8	0.8	0	3	7
2	2		0	IMC	0	0	0.30	2	1	154	96	0	135	252	23	184	0.8	86	39	101	55	4.72	2.59	14.2	#NULL!	2	0	0	0	1	0.5	0.5	0.5	0	2	0
2	2		0	IMC	0	0	0.30	2	1	154	96	0	135	252	23	184	0.8	86	39	101	55	4.72	2.59	14.2	#NULL!	2	0	0	0	1	0.5	0.5	0.5	0	2	0
2	2		1		0	0	0.30	4	0	126	72	0	121	215	25	140	0.9	102	45	99	67	3.11	2.20	15.1	#NULL!	3	1	1	1	1	0.0	0.0	0.0	0	2	1
2	2		1		0	0	0.30	4	0	126	72	0	121	215	25	140	0.9	102	45	99	67	3.11	2.20	15.1	#NULL!	3	1	1	1	1	0.0	0.0	0.0	0	2	1
2	2		1		0	0	0.30	1	0	118	84	0	201	276	21	178	1.0	55	26	87	31	6.85	3.35	12.2	#NULL!	5	2	1	6	1	0.3	0.5	0.8	0	1	6
2	2		1		0	0	0.30	1	0	118	84	0	201	276	21	178	1.0	55	26	87	31	6.85	3.35	12.2	#NULL!	5	2	1	6	1	0.2	0.8	1.0	0	1	6
2	2		0	IMC	0	0	0.30	1	0	124	88	0	89	183	24	145	1.0	88	35	67	32	4.14	1.91	11.1	#NULL!	3	2	1	6	1	0.2	0.2	0.2	0	3	6
2	2		0	IMC	0	0	0.30	1	0	124	88	0	89	183	24	145	1.0	88	35	67	32	4.14	1.91	11.1	#NULL!	3	2	1	6	1	0.3	0.3	0.3	0	3	6
2	2		1		0	0	0.40	1	0	116	70	0	143	208	24	187	1.0	59	37	97	74	5.05	2.62	12.2	#NULL!	3	2	1	6	1	0.0	0.0	0.0	0	3	6
2	2		0	IMC	1	0	0.40	1	0	116	70	0	143	208	24	187	1.0	59	37	97	74	5.05	2.62	12.2	#NULL!	3	2	1	6	1	0.0	0.0	0.0	0	3	6
2	2		0	IMC	0	0	0.30	4	0	118	84	0	119	211	21	122	0.9	249	39	93	31	3.13	2.38	13.6	#NULL!	3	2	1	6	1	1.0	0.6	0.5	0	3	#NULL!
2	2		0	IMC	0	0	0.30	4	0	118	84	0	119	211	21	122	0.9	249	39	93	31	3.13	2.38	13.6	#NULL!	3	2	1	6	1	0.5	0.3	0.3	0	3	#NULL!
2	2		1		0	0	0.30	4	1	156	94	0	214	311	31	187	1.2	112	42	90	64	4.45	2.14	12.4	#NULL!	2	2	1	6	1	0.2	0.2	0.2	0	2	6
2	2		1		0	0	0.30	4	1	156	94	0	214	311	31	187	1.2	112	42	90	64	4.45	2.14	12.4	#NULL!	3	2	1	6	1	0.2	0.2	0.2	0	2	6
2	2		0	PSC	0	0	0.30	1	0	120	80	0	158	326	19	206	0.9	122	39	107	87	5.28	2.74	12.5	#NULL!	2	2	1	6	1	0.3	0.5	0.5	0	1	6
2	2		0	PSC	0	0	0.30	1	0	120	80	0	158	326	19	206	0.9	122	39	107	87	5.28	2.74	12.5	#NULL!	2	3	1	6	1	0.3	0.3	0.3	0	3	6
2	2		1		0	0	0.30	1	0	118	64	0	116	248	21	154	1.5	103	37	85	49	4.16	2.30	12.2	#NULL!	2	1	1	5	1	0.5	0.5	0.5	0	1	5
2	2		1		0	0	0.30	1	0	118	64	0	116	248	21	154	1.5	103	37	85	49	4.16	2.30	12.2	#NULL!	2	1	1	5	1	0.6	0.6	0.6	0	1	5
2	2		1		0	0	0.30	1	0	100	64	0	75	228	24	250	0.8	65	42	84	54	5.95	2.00	9.4	8.60	4	0	0	7	1	0.2	0.2	0.2	0	3	9
2	2		1		0	0	0.30	1	0	100	64	0	75	228	24	250	0.8	65	42	84	54	5.95	2.00	9.4	8.60	3	0	0	0	1	0.2	0.2	0.2	0	3	8